The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXIX. October 15, 1938 No. 1,007

Revival of Business Confidence

BRITISH business men and industrialists in the last fortnight have justified themselves in no uncertain manner. They have given a remarkable proof of the health and strength, and particularly of the wonderful resilience of British industry. The important point is that it was spontaneous. It was not the result of any official action or planning. There was none of the juggling of the money market, which is so consistently pressed as the way to deal with trade resilience.

A striking illustration of this spontaneity was to be seen in the Sunday papers of a week ago. Advertising in the popular Press had been considerably reduced by the crisis. Readers could not fail to observe that the weight of newspaper material delivered to them morning by morning was much below the normal. Then suddenly on October 9 the business world, as represented by all the various classes of advertisers who use the Sunday papers, made up its mind to start again. In the result we had one or two of these national organs reaching their maximum capacity, and Sunday was spent in the good old-fashioned way, wading through forty pages of interesting literary material, and to many, even more interesting and voluminous advertising news.

The revival in newspaper advertising is only a pointer indicating a revival of general confidence and general health. There are many others. A curious example, which illustrates the general tendency, is to be found in Reuter's daily commodity index figure. Reason would suggest that the threat of war would enhance the price of commodities, but in point of fact Reuter's index drooped a little during the most tense days of the crisis. Past experience would lead to the supposition that the removal of the war threat would depress commodity prices, but exactly the opposite has happened and Reuter's index has mounted steadily since the Munich agreement.

These arguments only supplement the evidence of the Stock Exchange, which has just finished the gloomiest three weeks' account since 1918, an account in the course of which Consols dropped to 66 and wound up with prices generally slightly above the figures marked on the opening day.

A great deal of nonsense has been talked about the effect of the Czechoslovak crisis on British prestige abroad. Political faint-hearts have been gloomier on this than on any other phase of the crisis. Again the evidence of the business community is entirely the other way. There could not be a better example than that afforded by an ambassador despatched by Benn Brothers, Ltd., the proprietors of THE CHEMICAL AGE, to Scandinavia. In the first place he did not believe in the inevitability of war, and it simply never occurred to him to throw up his task half way through his mission and run to Great Britain for shelter. Next, he was able to write from Sweden, on the most critical day of all, this revealing note:—

> "One needs to be at a distance to get a situation like the present one into true perspective. I, and indeed every Englishman abroad, feels very proud to be the Prime Minister's fellow-countryman. He has made the prestige of the old country higher than it has ever been."

This unofficial ambassador travelled on to Finland where he was able to check the Continental attitude when the crisis had passed. Once more he was able to record a heightening rather than diminution of British prestige. He wrote that the attitude taken by the conductors of the policy of THE CHEMICAL AGE throughout the crisis had been enthusiastically endorsed by everyone he had met, whether in political or business circles.

The great drawback to trade for too many months has been a lack of confidence due to political uncertainty. The various factors that have been mentioned point to a revival of confidence through the removal of the most serious irritant that remained in the European body. British business men have rarely had a more promising opportunity for the display of their traditional courage and enterprise in the expansion of trade which is assuredly ahead.

Notes and Comments

Maintaining Pure Water Supplies

THE old tag about never missing the water until the well runs dry applies equally well to the purity of the water supplied by local authorities. Both are taken for granted. One is therefore very apt to overlook the careful bacteriological and chemical work entailed in maintaining the public water supplies at a high purity level. The severe typhoid epidemic at Croydon in February focused attention on the necessity of this work and now a more happy reminder of the part played by the bacteriologist and the chemist is provided by the completion of the new laboratories at Finsbury of the Metropolitan Water Board, to be opened by the Minister of Health on Monday. The main object of the laboratories' work will be the carrying out of water tests and examinations through four sections, chemical, bacteriological, biological and administrative. An enormous number of samples are handled annually, said to be larger than that handled by any other single laboratory unit in the world. The laboratories have accordingly been specially designed for this mass analysis and will serve as a valuable example for others to follow. The Board has long recognised the vital necessity of constant bacteriological and chemical analysis, the Board's first Director of Water Examination, the

late Sir Alexander Houston, being appointed in 1906. The value of this work is shown by the fact that in 1907 the standard purity figure of the water going into supply was 74.3 per cent. first class samples; by 1937 the percentage had risen to 99.

"Science is International"

DR. LAMPITT'S address to the Society of Chemical Industry contained many interesting thoughts, and among them one was struck by his call to recognise that science is to-day very definitely limited by territorial boundaries. There are lines of research and development that have some bearing upon national economics and upon national defence which are rigorously controlled. "We are heading," he says, "towards the total and complete control of scientific endeavour by Governments." Possibly that phrase may be a little wider in its implications than Dr. Lampitt intended; Governments are using scientific research so greatly for their own ends that they may in certain countries have almost seemed to monopolise the services of the available scientific workers. In our own country research associations partly financed by the Government would seem to enable movement in the same direction. Is this tendency good or bad? Very much depends upon the outlook of the individual towards science. It depends upon whether he spells the word with a capital S or not. Pure science may fairly justly be said, we believe, to have no boundaries. We cannot see much possibility of research upon the structure of the atom, upon the constitution of coal, upon the dimensionality of space, or the cure of cancer being denied an international exposition. Once we begin to apply science to the solution of everyday industrial and defence problems, we arrive at a different stage, we are in a situation wherein the ordinary laws do not apply. But for the operation of the patent laws, it is safe to say that industrial scientific research would be cloaked in an atmosphere of complete secrecy, not only while the research was in progress, but after the results had been known and applied.

Ethics of Scientific Secrecy

IF a nation makes a discovery which gives it an advantage over its competitors, either for peace or for war, why should it be published broadcast? If a firm makes a similar type of discovery, is it bound to tell its competitors all the details? Morally, the answer to both questions is that there should be no secrecy, but that science should be applied impartially for the benefit of mankind. To hold such views is to be on the side of the angels; but the world is yet imperfect and, as recent events have shown, that abstract thing we call science must be used as a tool in a world that is governed by human passions and human appetites. Dr. E. C. M. Joad concluded a recently-published essay with the challenging sentence: "It is important to remember that most human actions have been harmful." It is a harmful action, in theory, to lock away scientific discoveries so that they are kept in reserve for some future occasion, or used only for the benefit of the few; but in practice it does not matter very much, for the closely guarded secret of to-day becomes the common-place of to-morrow and, in a world in which education is advancing so fast, that transformation must be accelerated. In the case of a secret held by a Government and an industrial firm, a Government may tend to sterilise the discovery, a commercial organisation will exploit and develop it.

Railway Research

THE L.M.S. Research Department owes its inception to a small chemical laboratory set up by the old London and North Western Railway at Crewe so long ago as 1864; and it now comprises chemical laboratories at Crewe, Derby, Horwich and Glasgow, a physics laboratory at St. Pancras, and a large modern laboratory at Derby containing sections devoted to engineering research, metallurgy, paint and textiles. Lord Stamp in 1928, noting the value of a scientific approach to problems due to the increasing complexity of equipment and materials, asked a number of eminent men to advise him whether there was scope for a more sustained and better organised research policy on the railways. The result, as all know now, was the building of a modern research laboratory at Derby, which was opened by Lord Rutherford in 1935.

A Railway Research Department

THE L.M.S. research department is first a clearing house of information watching, *inter alia*, progress outside the company and drawing the attention of the other departments to what is being done. By reason of its duties a railway company is interested in the products of practically every industry in the country, either for conveyance or because it can use them for its own purposes. The research department must, therefore, also be prepared to act as scientific consultants, and to discover materials to meet new needs of other departments. The work may thus comprise metallurgy, textile research, food chemistry, refractories, and so forth. The physics section is concerned with the refrigerated transport of perishable foodstuffs, and other materials which require careful handling for one reason or another. There are also the problems of lighting, heating, soundproofing, ventilation and air-conditioning both in trains and hotels.

Chemical Appointments

THE recently issued report of the Chemistry Research Board referred to the number of members of the Chemical Research Laboratory staff who had left the laboratory for appointments in industry during the triennial period ended December 31 last. This state of affairs brings to mind the old question of salaries. It might well seem to the uninitiated that services to the nation as a whole should command higher salaries than equivalent services to individual firms. A national organisation should set an example. Yet when an advertisement was inserted in the Press for the post of Director of the Chemical Research Laboratory, to succeed Sir Gilbert Morgan who recently retired, the salary proposed was no more than £1,250 a year, a figure which would surely not attract the chief chemist from any first-rate industrial laboratory, and which is well below that of many a commercial manager of undertakings a good deal smaller than that at Teddington. The general manager of a large industrial undertaking, formerly a research chemist of some eminence, has remarked: "There comes a time in the life of any man who wishes to make provision for his old age when he must earn enough money to enable him to save. It is then that the wise forsake chemistry and take to business." This is rather cynical advice, although perhaps mainly based on fact. But it must be added that the true chemist would be unhappy if he gave up his work and, further, his business propensities are an unknown quantity.

The Electrolytic Manufacture of Hydrogen Peroxide

By
G. ZOTOS

HYDROGEN peroxide is known to be one of the most valuable oxidising agents in modern technical chemistry. At the commencement of the present century the 30 Vol. solution normal at the time was still employed, exclusively for pharmaceutical purposes, and was obtained by means of the decomposition of barium peroxide. To-day the electrolytic process has considerably improved the quality of the product, its concentration and the ease of manufacture, so that hydrogen peroxide is now made and used daily by tons in 100 vol. solution. Its importance as an oxidising agent in bleaching and washing, preserving and sterilising has thereby increased.

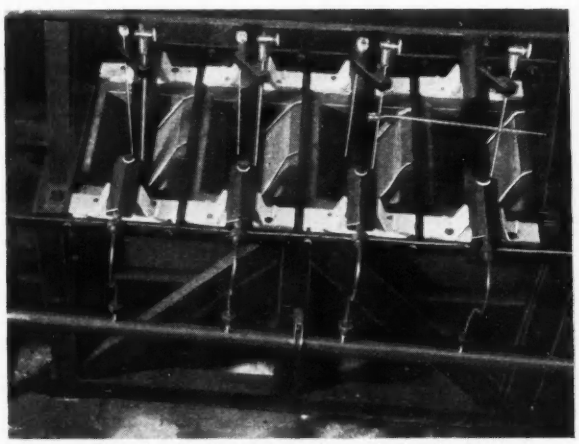


Fig. 1. Early type of electrolysis plant.

In previous articles I have dealt with some of the principles of the earlier state of the art[1]. In the meantime, much progress has been made and factories have been established to meet the constantly increasing demand. The gradual displacement of the old barium peroxide method by the electrolytic one as emphasised by me at the time has been confirmed by the number of works now undertaking the electrolytic method of production.

The idea of producing hydrogen peroxide electrolytically dates back to the commencement of the century[2]. Whereas Urbasch described in a patent theoretical ideas without complete practical details, the Oesterreichische Chemiker Werke, of Vienna, were the first to succeed in producing hydrogen peroxide by electrolysis on the commercial scale; sulphuric acid was used as electrolyte with subsequent distillation in a high vacuum. Potassium persulphate has also been employed[3] for the continuous production of hydrogen peroxide free from by-products. Since then, the electrolytic method has become classical and general. A further practical improvement has been made by utilising the ammonium salt of persulphuric acid[4], a mixture of sulphuric acid and ammonium sulphate being electrolysed with subsequent distillation in a continuous process. It would appear that this method is steadily gaining in importance.

The carrier of the active oxygen is, in all cases, the per-ion S_2O_8. Broadly speaking, it is theoretically immaterial what

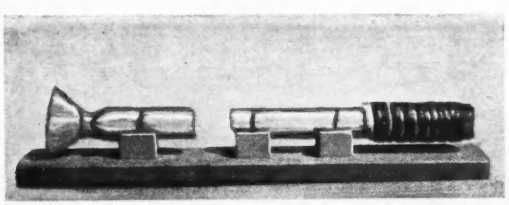


Fig. 2. Jena hard glass heating element for distillation.

serves as the complement for forming the per-compound, which on hydrolysis gives the hydrogen peroxide. For one molecule of persulphuric acid, potassium persulphate or ammonium persulphate can theoretically, and under all conditions, give on hydrolysis one molecule of hydrogen peroxide:

$$M_2S_2O_8 + H_2O \xrightarrow[\downarrow H_2SO_4]{} M_2SO_5 + H_2O \xrightarrow[\downarrow M_2SO_4]{} H_2O_2$$

In practice, however, it is quite different. Both in the electrolysis and in distillation, the behaviour is markedly different according to the cation. It is known from many classical works[5] that sulphuric acid gives strikingly low current efficiencies, whereas pure ammonium sulphate leads to very high figures which, under certain circumstances, may represent a current efficiency of over 90 per cent. Their mixture is in general used for the preparation of hydrogen peroxide.

Potassium persulphate can only be made by indirect methods, so that for carrying out the so-called Pietsch-Adolf process[6], the residue after distillation containing potassium

Fig. 3. Distillation apparatus at the 1937 International Chemical Exhibition.

bisulphate is regenerated into potassium persulphate by the aid of fresh ammonium persulphate solution electrolytically prepared. While, therefore, in the last-mentioned process, the substances carry out two somewhat different cycles in respect of the electrolysis and the distillation, the ammonium sulphate process is a single stage one since a single solution, varying only in water content, circulates between distillation and electrolysis. A compromise as regards the energy consumption must be made, since the conditions for a good efficiency in the two phases are almost contrary to each other. A certain concentration of sulphuric acid[7] favours the distillation, but in principle reduces the efficiency of the electrolysis.

The electrolysis is carried out with platinum anodes; all previous efforts to replace this expensive metal by others have been unsuccessful, since the combining of the per-ions

necessitates a high anode potential. The mechanism of this coupling process has been extensively studied[8]. An excess potential of more than one volt is necessary in order to obtain a good current efficiency. This means a high surface loading of the anode, but in addition, as the important works of Müller and others have shown[9], a high volume loading of the electrolyte is necessary. In the course of commercial development, current concentrations of the order of over 1,000 amps. per litre of electrolyte have been already used. It will be understood that these heavy current loads make the practical construction of the cells very difficult. Great attention must be paid to efficient cooling, mainly because secondary reactions taking place during the electrolysis are encouraged by elevated temperatures[9].

An Early Type of Electrolysis Plant

Figure 1 shows an early electrolysis plant constructed by the author for the production of hydrogen peroxide, a sulphuric acid solution of ammonium sulphate being electrolysed with an average current loading of 450 amps. per litre. This construction of cell is now out of date. At the time, it was distinguished, *inter alia*, by its good cooling capacity, being designed on the principle of the cooled anode and cathode, the cell itself being used as the cathode. The concentrically mounted anode surrounded an annular space of almost constant cross-section which was charged with the electrolyte.

Although electrolysis has been carried out successfully for many years, especially when this was directed towards the production of per-compounds without reference to conditions imposed by the distillation, yet in the early days this distillation of the ammonium persulphate presented great difficulties as regards the process and apparatus used. Many years' experience have been required to overcome these and to carry out the closed circulating process with good yields.

The question of apparatus is also very important for the economy of practical working. The solutions used in the process are similar to strong sulphuric acid in their corrosiveness and attention has to be paid to this factor in the construction of the distillation apparatus. Quartz tubes have been used as heating elements[10], but in addition to their great friability they have the disadvantage of a low heat conductivity which is worse than that of glass. Consequently, as long ago as 1929 the author commenced to use with success a well refined technical glass for the distillation tubes and chose for this purpose Jena hard glass which is sufficiently resistant to heat. Figure 2 shows a heating element of such a hydrogen peroxide installation. This material has been found very suitable and is not affected by the sulphuric acid and the persulphates. Recently, glass has been adopted by others[11]. As glass as a constructional material behaves in respect of product purity much better than other materials, I have continuously advocated its use in the construction of large hydrogen peroxide installations. Figure 3 shows a distillation apparatus of notable dimensions which the Jenaer Glaswerk Schott & Gen. exhibited in operation at my instigation at the last International Chemical Exhibition at Frankfurt a.M., in 1937.

Metallic Distillation Tubes

Lead has frequently been adopted as the material for making the distillation tubes[12], since other metals and also special steels, have not been found satisfactory. A particular peculiarity of these metals is that they produce a strong catalytic decomposition. The noble metals are also unsuitable, and experiments carried out by the author with platinum, gold-platinum and chromium-gold alloy tubes showed the astonishing rapidity of the catalytic decomposition.

Thus for many years the trade has had to be satisfied with lead distillation tubes, which require frequent renewal. This increases working expense and means more frequent purification of the solutions. The author has recently found that commercial silicon is a very advantageous material for making the distillation tubes[13].

In the distillation the making-up of the deficit of water is of great importance from the practical point of view as, by reason of its physical properties, first the water and then the hydrogen peroxide tends to evaporate in the hydrolysis process. There is consequently under all circumstances a natural tendency towards a deficit in water content which is made up by different processes. It is known from earlier works that the addition of water during the distillation process can increase the yield even up to the theoretical limit[14]. Water vapour behaves similar, acting hydrolytically on the liquid phase[15]. According to modern processes, pure steam or water is added, but it is important in carrying out such an operation to add as little as possible[16] as the addition of steam or water increases the consumption of cooling water and makes it necessary to increase unsuitably the size of the apparatus for the concentration of the distillate.

A further process, necessary in continuous working, is the regeneration of the solution. This is done at different intervals of time in order to remove impurities, in particular metallic impurities. The platinum electrodes give off, especially in the first period of working, particles of platinum[17] which have a high decomposing effect. Other metallic impurities, which are, for example, slowly dissolved from the stoneware material, gradually collect in the liquid during the circulation. Particularly when using lead, soluble impurities are produced and these can be removed in various ways[18]. It will, of course, also be understood that the water added to replace that consumed in the electrolysis and subsequent hydrolysis must be of high purity. The complete process is sensitive, requiring expert knowledge and experience. This, and the existence of a series of blocking patents, explain why this manufacture is carried out at comparatively few places.

Hydrogen peroxide is gradually decomposed by short light waves, dust, alkalies and heat. This becomes considerable if impurities, especially heavy metals, are present to act as catalysts to the decomposition. This is a disadvantage of the product obtained from barium peroxide, from which it is difficult to remove the heavy metal entirely. The electrolytic product, as a result of distillation, is entirely free from such impurities so long as suitable precautions are taken to prevent the passing over of constituents of the solution into the product distilled over. Products are even obtained electrolytically which can be brought to the high concentration of 40 per cent.

References

[1]Zur Technik der Wasserstoffsuperoxyd-Herstellung. G. Zotos *Chem. Ztg.*, 1930, *69*, 665-686.
[2]F.P., 371, 043.
[3]D.R.P., 243, 366, 256, 148, etc.
[4]D.R.P., 510, 064.
[5]E. Müller, O. Friedberger, Elbs, Schönherr, etc.
[6]*e.g.* at Henkel & Co.'s, Düsseldorf.
[7]H. Palme, *Z. fur. anorg. allg. Chemie*, 1920, *112*, 97.
[8]W. D. Bancroft, *Trans. Electr. Soc.*, 1937, *71*, 195.
[9]E. Müller, Elektrotechnisches Praktikum (1924) (Dresden).
[10]D.R.P., 249, 093.
[11]B.P., 442,029.
[12]D.R.P., 572, 801
[13]B.P., 473,344.
[14]Dissertation W. Reichel, Munich, 1912.
[15]Dissertation : Anders, Dresden, 1913.
[16]B.P., 473,343.
[17]Festschrift Siebert, Hanau, 1931.
[18]B.P., 473,342.

PUBLIC HEALTH EXHIBITION

THE Public Health Services (Engineering and Equipment) Exhibition and Congress will be held at the Royal Agricultural Hall, London, on November 14-19.

It is anticipated that not less than 1,500 to 2,000 officially appointed delegates from local authorities will attend the Congress at which several sessions will deal exclusively with air-raid precautions.

The exhibition, which is held in the same hall, and during the same period as the congress, will comprise over 1,500 sq. ft. of space, which has been let to many well-known firms specialising in machinery, apparatus and equipment used in various health departments of local government.

The Rating of Industrial Concerns*

Principles and Practice with Special Reference to Chemical Works

By

P. MICHAEL FARADAY

THE subject of local rates payable on factories in the chemical industry is one that has become, in recent years, rather an unimportant factor on the costing side of most undertakings of this description. This is due to modern legislation which first of all exempted process plant, except in those cases where such plant was in the nature of a building or structure, and latterly the De-Rating Act has reduced the liability of such concerns for local rates by 75 per cent. of the amount payable, which is governed entirely by the valuation fixed under the Rating and Valuation Act, 1925, on the land, buildings and certain classes of machinery only.

As a matter of history, it is interesting to remember that down to the year 1929 all plant and machinery in any given factory was rated upon the hypothesis that an occupier would pay a rent, and that included in such rent would be the right of user of all plant and machinery which made up the works as a whole for the purpose for which it was used.

In theory, this method of valuation might be said in a sense still to exist, because the rent of the equipped concern should be ascertained, allowance then being made for the machinery and plant which was exempted under the 1925 Act, and then a further allowance made of 75 per cent. of the total rent or net annual value so ascertained, in order to find the ultimate rateable value upon which local rates are collected. There seems to me to be a certain amount of justice in assessing a factory on a consideration of its productive powers, involving something for the use of the plant and machinery. In other words, if a factory were described as a brewery, the plant therein made it a brewery, for without this it ceased to be a brewery and only the four walls and floors of the structure remained.

At various times, however, the Government, no doubt in the interest of industry, have reduced the circle which originally embodied all the plant necessary for any particular process as liable to contribute to local burdens, to a point to-day which merely involves the assessment of the land, the buildings and plant which are in the nature of structures, and primary motive power.

Basis of Assessment for Chemical Works

In the case of a chemical works, this modern basis of assessment leaves the valuer's functions very difficult to carry out, having regard to the definition of net annual value from which the rateable value is derived. Net annual value is described in the Act as the rent at which the hereditament might reasonably be expected to let from year to year if the tenant undertook to pay all usual tenant's rates and taxes and tithe rentcharge, if any, and to bear the cost of the repairs and insurance and the other expenses, if any, necessary to maintain the hereditament in a state to command that rent.

In the case of factories, the rateable value was the same as the net annual value. Under the Act of 1929, in the case of an industrial hereditament the rateable value shall be taken to be one-quarter of the net annual value, subject to the proper division between industrial and non-industrial parts of the concern and the provision in the 1929 Act that non-industrial parts, provided they do not exceed 10 per cent. of the whole, shall be treated as industrial and subject to the allowance of 75 per cent.; but where they do exceed 10 per cent. of the whole, so much of the excess shall be rated at its full net annual value, again by a complicated calculation to which reference need not be made in a paper of a general character.

Under Section 24 of the 1925 Act, however, no account shall be taken of the value of (1) plant and machinery in or on a hereditament except machinery and plant (together with the shafting, pipes, cables, wires and other appliances and structures accessory thereto) which is used, or intended to be used, mainly or exclusively in connection with any of the following purposes:—

(*a*) the generation, storage, primary transformation or main transmission of power in or on the hereditament; or

(*b*) the heating, cooling, ventilating, lighting, draining, or supplying of water to the land or buildings of which the hereditament consists, or the protecting of the hereditament from fire.

Provided that, in the case of machinery or plant which is in or on the hereditament for the purpose of manufacturing operations or trade processes, the fact that it is used in connection with those operations or processes for the purpose of heating, cooling, ventilating, lighting, supplying water, or protecting from fire shall not cause it to be treated as falling within the classes of machinery or plant specified as follows:

Lifts and elevators mainly or usually used for passengers.

Railway and tramway lines and tracks.

Such part of any plant or any combination of plant and machinery as is in the nature of a building or structure.

Definition of Structural Plant

Here follows the list of plant which may be partly in the nature of a structure, as fixed by a committee set up to define the meaning of the Third Schedule to the 1925 Act:—

Acid Concentrators; Bins and Hoppers; Blast Furnaces; Bunkers; Burners, Forges, Furnaces, Kilns, Ovens and Stoves.

Chambers for:—

- Absorption of gases or fumes
- Aerographing and Spraying
- Bleaching
- Chemical Reaction
- Conditioning or Treatment
- Cooling
- Drying
- Dust or Fume Collecting
- Fibre separation (Wool Carbonising)
- Fuming
- Impregnating
- Refrigerating
- Regenerating
- Sandblasting
- Sterilising
- Sulphuric Acid.

Chimneys; Coking Ovens; Condensers and Scrubbers (acid, alkali, gas, oil, tar); Conveyor Gantries; Cooling Ponds; Crane Gantries; Cupolas; Economisers; Elevators and Hoists; Evaporators; Fan Drifts; Floating Docks and Pontoons, with any Bridges or Gangways not of temporary nature used in connection therewith; Flues; Flumes and Conduits; Foundations, Settings, Gantries, Supports, Platforms and Stagings for plant and machinery; Gas Holders, Producers and Generators, and Purifiers and Cleansers; Headgear (Mine, Quarry and Pit, and Well); Hydraulic Accumulators; Pits, Beds and Bays (Casting, Cooling, Drop, Inspection or Testing, Liming, Soaking, Tanning, or other Treatment, Settling); Racks; Refuse Destructors and Incinerators; Retorts; Ship Construction and Repair (Cradles, Grids, Slipways, Uprights); Silos; Stages, Staithes and Platforms for loading, unloading and handling material; Stills; Superheaters; Tanks.

Towers for:—

- Absorption of gases or fumes
- Chemical Reaction
- Cooling
- Oil Refining and Condensing Treatment
- Water

Transporter Gantries; Transversers and Turntables; Vats; Weighbridges; Windmills; Wireless Masts.

The foregoing list may be useful as a record, but the recommendations on the construction of the Act by the Committee set up to define the items of plant which are rateable, still leave great doubt upon a variety of matters included in the schedule. It is easy to say that a coke oven is to be rated only to the extent that any part is in the nature of a building or structure, but what parts are and are not of this character

* From a paper read at a joint meeting of the Institution of Chemical Engineers with the Incorporated Association of Rating and Valuation Officers, held on Tuesday.

are not defined. Briefly, it is assumed that of the total cost of a battery of coke ovens, about 50 per cent. could be attributed as landlord's property and 50 per cent. to the tenant.

This raises the question, in the author's view, of the absurdity of applying the other part of the Act of Parliament, in which we are told to determine the rent at which the property would let, and we have to assume a rent minus half the vital parts of that manufacturing process as being the property of the tenant, the remaining half being the property of the landlord.

I know that the Institution of Chemical Engineers is non-political and that politics are not to be discussed, but there is little doubt that the partial exemption from rating of machinery and the de-rating of factories were political moves, the far-reaching effects of which it is difficult to foresee. The owner of a chemical works runs the risk of the assessment to which he has agreed while de-rating is in force becoming the foundation of his new assessment if de-rating were to be removed. There is no doubt, in the author's opinion, that assessments of industrial concerns are far too high to-day under modern legislation, but owing to the fact that rates are payable only on one-quarter of the net annual value, factory owners generally throughout the country have not thought it worth while to contest the amount of assessment.

It seems an anomaly that in a brewery, where malt is introduced into the mash tubs and, after grinding, passed to coppers where hops are added and then to bins where fermentation takes place, that the whole of the plant is considered as process plant and not rateable, so that in effect only the land and the shell of the brewery is now assessed at the full rate; whereas blast furnaces are held to be in the nature of a structure, which undoubtedly they are, but they are also essentially process plant from the start to the finish of the operation of converting iron ore into pig iron.

There is not the slightest doubt that the old process of valuation, which took into consideration everything that went to make the works ascertained the true rent that would be paid for any given works. Having arrived at that figure, if Parliament desired to make a concession to the industrialist, instead of omitting from this total figure a variety of items such as pipes and other paraphernalia which might be termed process plant and not in the nature of a building or structure, a percentage allowance could have been made from the full rental value as ascertained formerly.

In other words, as a matter of valuation and as a matter of assistance to all those who have the management with regard to the payment of local rates, instead of complicating the issue by suggesting that one article of plant or machinery shall be rateable and another shall not, an allowance—if justified at all—should have been made from the total value. We are not concerned that a further allowance was made under the De-Rating Acts, but what we are concerned with is to ascertain what is the true net annual value of any works and this to-day is practically an impossibility, except by the broadcast of compromise; and that is probably why no case, so far as the author is aware, has been brought in connection with a large chemical works, pure and simple, to define how much, if any, of the process plant is in the nature of a structure and how much is not and consequently is not rateable.

It is impossible to fix a rent for the majority of concerns, such as we are primarily interested in to-night, without doing one of two things—either including machinery and process plant, or omitting it altogether, except as to engines and primary power, and only attempting to fix a value for the housing accommodation of that plant.

If a chemical works has ever been let, no tenant has ever taken into consideration anything but his ability to turn the plant to profitable use, which is the only incentive to give a rent at all. With this mental attitude, the tenant is going to consider the state of the plant and whether or not it is obsolete, though even on the assumption that the plant is entirely up to date to-day the prospective tenant knows the risk of it becoming a back number to-morrow. In such a case only the buildings would be left and supposing the tenant scrapped the whole of the existing plant and introduced new plant, it in no way affects the rental value of the buildings, except to the possible extent that, with an obsolete plant, such buildings could not be used to their full capacity.

In the author's opinion, the whole matter is becoming an absurdity and the result is compromise everywhere, though the majority of assessments on chemical plants throughout the country are in excess of the true value as defined by the Act.

In the case of an ordinary dwelling house, allowance is made to cover the cost of the repairs and insurance, which are presumed to be paid by the landlord. In the case of all modern industrial concerns, the cost of repairs now falls upon the tenant—in other words, the rent that he would pay has to be fixed after the cost of repairs has been paid by him. These repairs represent very heavy items in many industries, but particularly in chemical works, where fumes affect the iron and brick work of the housing accommodation for the plant. This matter is very frequently lost sight of in connection with rating, because there is now no gross value for a factory (as in the case of a house), but only net annual value, the tenant doing all repairs, insurances, etc., and providing a sinking fund to replace the capital of the landlord —an amazing proposition.

The truth is that in a large number of works there is really very little left to rate nowadays, beyond the land and the containing walls and roof. If owners realised this, economies in rates could be effected.

Discussion

Rating of Gas Undertakings and Chemical Works Compared—Political Influence on De-Rating

After Mr. Faraday had read his paper a lengthy discussion on its contents followed. MR. J. W. NAPIER, who was unable to be present, expressed his views on the subject in a letter, which was read to the meeting.

The subject, he declared, was one bristling with difficulties and he agreed with Mr. Faraday that the existing practice was full of absurdities and that compromise, which so frequently entered into decisions, was unsatisfactory. Fresh legislation might provide a more satisfactory result, but he feared that a proposal of that kind was open to serious differences of opinion. There was, for example, the difference of method of valuation as between England and Scotland. Theoretically, the two countries should have similar systems of valuation and rating, but it had been authoritatively laid down that the general law and practice as to rating hereditaments of every kind were so different in the two countries that any attempt at assimilation would upset existing case law and lead to confusion in one country or both. It was one of the anomalies of rating in Scotland that plant which would be exempt if situated in a building became liable if situated in the open, and there had been cases where manufacturers had erected buildings around plant for the sole purpose of avoiding the liability to rating. Mr. Napier added that he believed that the de-rating of industry might be subject to legislative amendment in time to come.

Mr. Napier went on to instance the valuation of a gas undertaking in Scotland. He pointed out that a gas works was essentially a chemical works, carbonising coal and manufacturing marketable products, but the basis of valuation for assessment was totally different from other chemical works. A gas works was assessed on what was known as the profits basis and the method was practically the same for corporation as for company undertakings, except that the latter were allowed 20 per cent. deduction for tenants' profits. Gas works did not enjoy the advantage of de-rating, though

he might be permitted to mention that gas works were in competition with other chemical works to which de-rating was applied.

The valuation for assessment as between chemical industry in general and gas industry was usually out of all proportion to the value of plant and buildings as capital assets.

DR. WILLIAM CULLEN said he questioned whether politics were responsible for the de-rating of factories as Mr. Faraday had stated. As one who had taken part in the agitation for de-rating he understood that the measure was introduced to put industry on a footing that would enable it to compete with other countries. It had been felt at that time that the fact that this country was on the Gold Standard and that many works were situated in areas now known as distressed areas, where the rates were very high, greatly handicapped industry in its foreign trade. Dr. Cullen added that when he became somewhat enthusiastic about having a paper prepared for the institution he had overlooked the fact that the 1929 Act de-rated to the extent of 75 per cent. the previous rates. The question had therefore not the importance for them he thought it had at the time. He thought, however, from what Mr. Faraday and Mr. Napier had said that they had still a good case to go to the rating authority for reductions.

In answer to a further point raised by Dr. Cullen, MR. FARADAY said that air compressors would be classed as process plant. Where they were used for ventilation they would be liable for rating, but if they were used for manufacture in the factory they would be exempt. So far as the political motives behind the introduction of the 1925 Act were concerned he happened to know that it had nothing to do with helping industry, but was brought about by a political move to abolish the old Boards of Guardians and supersede them by public assistance committees and institutions. As the Boards of Guardians also dealt with rating, a new rating act was introduced, but though it exempted portions of machinery the new act in no way varied from the previous act.

In reply to a question put by MR. F. H. ROGERS, Mr. Faraday said that when a part of a factory was permanently closed down the occupier was entitled to relief in rates on the grounds that it was not full beneficial occupation. He also stated in answer to DR. A. J. V. UNDERWOOD that power which was used for the production of a commodity such as in an electric furnace was not rateable, but power which was used for driving a shaft was rateable.

MR. D. NORTHALL-LAURIE asked what the position of an electric power station would be so far as valuation was concerned if it used its off-peak current for chemical work, but Mr. Faraday replied that it would be extremely difficult to say, as he had never come across a case of that nature.

MR. F. E. WARNER suggested that in the near future there was likely to be considerable complaints about the fact that factories escaped 75 per cent. of their rates. In a short time there would be quinquennial re-valuing of house property, and that would lead to outcries from householders who would want to know why factories escaped.

MR. H. E. WHITING declared that before they upset the system of rating in this country they should make sure that they had something to take its place.

A vote of thanks to Mr. Faraday was proposed by MR. J. DAUGHTON, president of the Incorporated Association of Rating and Valuation Officers, who also thanked the Institution of Chemical Engineers for the opportunity of taking part in the meeting.

Society of Public Analysts

Election of Members at Meeting—New Colour Reagent for Lead Described

AN ordinary meeting of the Society of Public Analysts and Other Analytical Chemists was held at the Chemical Society's Rooms at Burlington House on October 5, the President, Professor W. H. Roberts, in the chair. The following were elected members of the Society: A. Andrew, B.Sc., A.R.T.C., A.I.C., N. J. Chalabi, B.A., C. C. Harris, B.Sc., A.R.C.S., F. D. M. Hocking, M.B., B.S., M.Sc., F.I.C., A.C.G.F.C., C. O. Tattersall, B.Sc., A.R.C.S., F.I.C.

The following is an abstract of a paper then presented. "A New Colour Reagent for Lead and its Use as an Indicator in the Titration of Various Cations and Anions." By B. S. Evans, M.C., D.Sc., F.I.C.

The new reagent is prepared from diphenylcarbazide, purified pyridine (only the B.D.H. pyridine preparation was found suitable for the purpose) and nitric acid, by a procedure which must be closely followed. With lead in solution, within a certain *p*H range, it gives a soluble red coloured compound which is proportional to the quantity of lead present. The colour is immediately discharged if the lead is precipitated, and the reagent will therefore serve as an indicator in the titration of lead by solutions of precipitants for this metal, the complete discharge of the colour indicating the complete precipitation of the load. Titrations of quantities of lead from 10 mg. downwards by titration with solutions of phosphoric, vanadic, molybdic, tungstic and arsenic acids or their salts are described. Conversely these acids can be titrated with standard lead solutions, the first appearance of red colour indicating the endpoint. Certain other metals give colorations with the reagent, and various applications of the reagent are suggested.

Two other papers read at the meeting were: A New Iodine Method for the Determination of Starch. Part V—Starch in Leaf Material (by J. J. Chinoy, M.Sc., Ph.D., D.I.C.) and The Determination of Cobalt in Animal Tissues. (By K. J. McNaught).

Manchester Section of O.C.C.A.

Opening Meeting of Session—Paper on Wetting Agents

THE Manchester Section of the Oil and Colour Chemists' Association opened its session on October 7 with a lecture at the Constitutional Club by Dr. Dean on the subject of "Wetting Agents." Before the lecture, the Chairman (MR. H. CLAYTON) expressed a warm welcome to the President (MR. A. J. GIBSON) who had found it possible to be present, and invited him to occupy the chair. This Mr. Gibson accepted, and addressed a few words to the meeting. He reviewed the recent position in which the Association had been faced with a curtailment of its activities owing to international affairs and expressed his satisfaction and pleasure that they were able to carry forward with the programmes as arranged. He mentioned the work which had been done by members of the Association in defence preparations, and appealed to all chemists to keep up with the times and always be prepared.

Dr. Dean then read his paper on "Wetting Agents," and gave a review of the development of these materials over a long period of time. He explained the process of wetting and gave examples of the many fields in which the process of wetting could be accelerated by the use of chemical compounds, resulting in the saving of time and materials. He suggested the further extension to the field of the paint and varnish industry and pointed out that this was a direction affording scope for a good deal of work and application.

In a short discussion which followed, the question of the difference between wetting and dispersion was raised, and Dr. Dean indicated that this was governed by the long and short chain molecules as to which was produced. Mr. Campbell pointed out that the colour and paint industry in general required the two properties of wetting and dispersion from the same material and suggested that mixed materials were what were needed.

After the meeting had closed Dr. Dean showed a number of wetting agents and gave a few experimental examples of their efficiency.

Letters to the Editor

"Training Scientists for Industry"

SIR,—This interesting lecture from the academic side by Dr. Rudge (published in last week's issue, pages 275-277) raises a number of questions when looked at from the industrialist's view-point.

In the three big industrial concerns with which I have been connected, the policy of the first (a large motor company) with regard to technical staff was rather different from that of the other two. In the motor company, there was a belief in the decentralisation of authority. This required a much higher standard of assistant than the average routine chemist, and the tendency in forming the laboratory was to take on only men with considerable industrial experience and some personality. The directors were fortunate in that the formation of the laboratory coincided with the industrial slump of 1931 and there were a number of first-class chemists available. Each man had to know the running details of some branch of industry in which the factory was concerned, e.g., one chemist was responsible for the half-dozen electroplating plants, another for the huge water treatment plant, a third with an assistant for the foundry, with its five cupolas, others dealt with steels, non-ferrous metals, oils, customers' complaints involving laboratory tests, etc.

These men did not have offices and assistants and clerks, they worked on a laboratory bench; they did what tests they required there themselves; they went down into the factory and had to make the processes work or get out. The managers had no time to read reports, they saw the chemist in charge if anything went wrong, they simply judged by results.

As a contrast, I remember one day a first-class graduate, who had just left a well-known university, came and stood about in the laboratory. He literally propped himself up against the bench, and went round talking to people the way most college students do, but we were too busy to talk to him and he disappeared at the end of the week. A manager said to me afterwards that he was recommended as a clever man, but never took his coat off and he was altogether too slow in action.

Well, that is one reaction of industry to the academic man, he's too slow in practice, he wants a lot of brisking up before he's really much use.

But this company represented new industry rapidly developing. In the other two companies with which I have been connected the industry is more stable, and has been going on for some 60 years in each case. In these there was opportunity for the first-class research man and facilities in the way of research equipment. But as Dr. Rudge says, only the cream of academic men can be taken on and those with industrial or foreign experience, in addition to the publication of research papers, are always preferred. For each research worker there must be 8 or 10 technical and routine assistants.

It is a mistake, however, to suppose the laboratory assistants are in dead-end jobs. The tendency to-day is to transfer them on to the works side if they have the personality and put them in charge of factory production. Then there are always new jobs occasioned by the ever-changing public demand and the man who shows any signs of inventive capacity is soon picked out and may find himself developing a new line of business for the firm.

As regards training, Dr. Rudge's scheme should be helpful if the boys can afford the time before they are earning in which to take it. Personally, I like to start our technical men at about 16, and if they have had six months or a year's laboratory training before they come to us so much the better. It is not so much that we expect them to have any book knowledge as that they should be accustomed to handling laboratory apparatus, chemicals and burners, without undue breakage or injury to themselves or others.

The work of every company is more or less specialised, and the processes used in the laboratory have usually been carried far beyond those of the academic man. I do not mean in absolute accuracy, but rather in speed and convenience to the *required* accuracy, so that previous academic knowledge of particular processes is of little value; being able to handle a burette, a voltmeter, a blow-pipe efficiently, quickly and without mistakes is of much more value.

As an example of the difference between academic and industrial methods the development of cupola control in a very large foundry may be given. It was first found that the metal could be controlled to the required compromise between wear and machinability solely on the silicon content. Standard silicon determinations taking 2-3 hours could not be considered, and the process was cut down to about 15 min. by using control samples and cutting out all the usual precautions; the required accuracy was maintained but with the speeding up of production the method was soon found to be too slow. The foundry chemist, who was also necessarily a metallurgist, was compelled to find at short notice another method for controlling his cupolas. He tried casting step-bars, which would show up on fracture the nature of the metal. By working on this all one week-end he made a set of standard fracture samples correlated with chemical analysis. All he had to do then was to pour a tiny step-bar while the ladle was being filled, quench it and fracture it and from the fracture, in less than one minute, and before the metal was required for pouring, to pass or reject each individual ladle; incidentally this method of control cut the scrap down to 1/10th.

You cannot teach people to be able to deal with problems like that, all we can do is to take them into the works early, and keep contact by having the laboratory men in and out of the works all day. The more they are alert and observe and ask questions the more useful they will become.

To conclude, I would say that academic men coming into industry would be much more useful if they were started off with six months in the works under the works manager dealing with urgent practical problems before being allowed inside the laboratory.

The technical assistants are best started young, they must learn such theory as they need at night school, their job is far more interesting than that of most factory or office workers. Their chances of promotion, since they are often doing special jobs for the management, are better than average and will depend as much on their energy, personality and general knowledge of the works as on their specialised skill.—Yours faithfully,

SENIOR WORKS AND RESEARCH CHEMIST.

October 10.

FALSE TRADE DESCRIPTION ALLEGED

IN a case at West London Court on Tuesday two summonses were heard against the London Co-operative Society, Ltd., who were alleged to have infringed the Merchandise Marks Act by selling a preparation to which the false description of pure halibut liver oil, guaranteed, was applied on the label.

It was stated that a spectroscopic analysis had shown that the article contained partly halibut liver oil and partly whale liver oil, but Mr. Glyn Jones, defending, contended that this new test was not yet generally recognised in the scientific world. He also argued that halibut liver oil had to be adjusted to standardise its vitamin content.

Dismissing the case, the magistrate observed that he was quite satisfied the article sold was not pure halibut liver oil, but the society was entitled to a dismissal under the proviso of the Act because it had "no reason to suspect the genuineness of the trade description."

A CASEIN factory is under construction at La Rochelle by the Soc. An. Charentaise des Matières Plastiques whose annual casein output already stands at 500 to 600 tons.

Rubber as an Engineering Material*

By
DR. WILLIAM C. GEER

UNTIL recent years the rubber parts of all rubber articles used in connection with machinery have neither carried sizable loads nor transmitted power. Although uncounted tons of ore, coal, and coke have been transported upon conveyor belts, and although belts and automobile tyres transmit power and carry loads, the purpose of their rubber parts is to hold together the strong plies of cotton fabric and to protect them from abrasive wear.

Then, too, the softness of rubber compositions relative to metals and their ability to conform to the irregular surface shapes of structures led to their early and continued use as valve discs and pipe-joint gaskets for water, steam, and air lines. The electrical properties of rubber coupled with its flexibility gave rise to its extended application as wire insulation. Rubber compositions of the correct sort are highly resistant to acids and many other chemicals, hence they can be used as linings for tanks in which chemical processing is accomplished. It is notable, however, that the rubber parts, as differentiated from the metal or fabric parts of all these and many other so-called rubber articles, are relatively thin and carry no load.

Vulcanised Rubber's Ability to Absorb Energy

In this paper no exposition is undertaken of the physics of rubber in relation to energy absorption or to the design of blocks and shapes for that object. Reference is made to a few pertinent analyses already published. Hirshfeld and Piron[1] described rubber with reference to its use as springs for street-cars. Macbeth[2] discussed rubber in automobiles with particular attention to wheel suspension. Hahn[3] describes a particular type of support for heavy machinery. For data on the physics of rubber one should refer to the excellent chapter by Vogt[4] in a recent book.

Therefore, this discussion is limited to some of the high points of the history of rubber compounding with the especial object of showing why it has been possible only within recent years to use rubber as an engineering material, and why to-day it is possible to manufacture and use rubber successfully in a structure as a component part upon which the essential performance depends. These parts may be of any desired dimensions, either large or small, and are of especial value in supporting vibrating and shock loads because of the inherent peculiar ability of vulcanised rubber to absorb energy.

Rubber is a vegetable product that exists in the form of extremely fine particles dispersed in an aqueous medium in veins of the bark of certain trees which grow in the tropics. When these trees are cut, or according to a well-understood system the bark is tapped scientifically, a thin milky fluid exudes. This is called latex. It runs into cups attached to the tree, is collected, and is taken to a central factory where the rubber content is coagulated by means of a small percentage of acetic acid. After this coagulated product is washed and dried it becomes the solid crude rubber which is the basic ingredient of the vast majority of rubber articles.

Development of Rubber Technology

During recent years considerable quantities of liquid latex have been shipped from the Far East to this and other manufacturing countries either in its natural concentration of from 36 to 38 per cent. total solids, or in one in which the rubber content has been brought up to 60 per cent. or more. A new science and art of manufacturing rubber articles directly from liquid latex has developed during the last ten years. We are not concerned with these processes in engineering, because latex, as distinct from solid crude rubber as a raw material, has value primarily in the manufacture of small articles, and those which have high extensibility. This state of the art may not be permanent, however.

Up to the year 1839 the only rubber known was crude rubber, which possessed the unfortunate properties of solidifying to a leather-like product when its temperature fell to freezing, becoming even brittle at below-zero temperatures, and softening to a sticky mass in hot weather. Crude rubber has high plastic flow and a softening point or range, but little above that of atmospheric temperature. Naturally these properties restricted the use of this material. Charles Goodyear in 1839 discovered that when a mixture of rubber and sulphur was heated its physical properties were altered. This process was called vulcanisation, and that year marks the beginning of the rubber industry. Vulcanised rubber is non-thermoplastic at temperatures well above the highest atmospheric and remains elastic down nearly to—70° C.

However, the Goodyear type of vulcanised rubber compound was an irregular product. Crude rubber varied according to its source, and it was all obtained from forest trees of several species. The time required to vulcanise a mixture of rubber and sulphur alone was long, about two to five hours. Certain substances were known which would increase the rate of vulcanisation, but speeds were difficult to control and physical properties could not be exactly reproduced. Different lots or batches of vulcanised rubber were apt to vary due to the difficulty of obtaining the proper cure, or vulcanisation. We now know that some of these troubles were due to variability of crude rubber, to the nature of the various ingredients mixed into it, and also to the lack of accurate control of steam used to supply heat. It was natural, therefore, that the majority of rubber articles were those which could be useful when the rubber parts of them were relatively thin in section, when physical tolerances were large, and when rubber was supported by cotton fabric.

Irregularities in Degree of Vulcanisation

During the period 1839 to 1906, coincidental with the demand from industry, there was a steady development in the use of vulcanised rubber for conveyor belts with a surface to resist abrasion, hose to carry water and air, belts for power transmission, gaskets, tyres, shoes, surgical goods, wire insulation, and similar articles. The solid tyre is about the only one of a long list of rubber products, the dimensions of which were comfortably large, and even these solid tyres, cured under the most careful conditions then known, were not identical from surface to centre in degree of vulcanisation.

Of the several reasons for these irregularities the chief was the type of substance used to speed the combination of sulphur and rubber. It is now common knowledge that this combination is chemical and not simply a physical absorption between these two substances. Certain catalysts or accelerators were well known, of which lead oxide, magnesium oxide, and calcium hydroxide were most usual. It was necessary to use relatively high proportions (from 5 to 20 per cent.) of these materials and from 10 to 16⅔ per cent. of sulphur to obtain a satisfactory product, which meant in those days a strong, snappy vulcanised product.

During the first ten years of the present century the results of two pioneering efforts became known and available to the rubber industry. The first of these was the development of the rubber plantation in the Far East, which originated with Sir Henry Wickham, who started the enterprise on the island of Ceylon in 1876. As has been stated wild forest

*Presented at the Symposium on Rubber held in Providence, R.I., on October 5, in conjunction with a meeting of the American Society of Mechanical Engineers. From *The Rubber Age* (New York).

trees constituted the whole source of supply of crude rubber. There were many botanical species and many qualities of crude rubber from many countries. Wickham wisely chose his seeds from the one best strain of the species *Hevea brasiliensis* of the upper Amazon River valley. Because of his vision and the efforts of the English and Dutch planters, some 98 per cent. of crude rubber now used throughout the world comes from well-regulated plantations where the trees are cared for, and the rubber latex is collected, coagulated, processed, and shipped with adequate scientific supervision. Therefore, even though crude rubber is of vegetable origin and shows some variations, nevertheless a standard, reliable, uniform product, capable of reproduction in any desired tonnage, is available.

Organic Accelerators

The physical irregularities of vulcanised rubber have been conquered by a series of extensive chemical investigations which began in 1906. In that year George Oenslager, of Akron, Ohio, discovered that when small quantities of aniline oil, in the order of 1 per cent. in terms of rubber, were mixed with the crude rubber and sulphur together with some zinc oxide, the vulcanisation took place in much shorter periods of time. Not only that, but smaller proportions of sulphur were required to yield maximum physical properties. What was equally significant in those days, low grades of crude rubber gave much higher tensile-strength values than when vulcanised by aid of litharge. Because this new material was organic in character, the use of the term organic accelerator naturally followed.

Following this discovery and the practical application of it, a large number of researches were undertaken and literally hundreds of organic accelerators were found, each of which possesses its own peculiar effect upon the time and temperature of vulcanisation, and also upon the physical properties of the vulcanised rubber mixture.

Of especial pertinence to the use of rubber in thick blocks as an engineering material is the characteristic of certain organic accelerators which when mixed with rubber and not too high a proportion of sulphur, permit vulcanisation at a given temperature over long periods of time without over cure. For example, two compounds A and B are mixed of the same materials and proportions except that they contain different accelerators. Sheets of each of these are vulcanised in a press at 287° F. for periods ranging from ten to ninety minutes. Test pieces are cut and broken in the testing machine and a curve of tensile strength versus time of cure is obtained for each respective compound.

The curve of compound A shows a rapid rise in tensile strength with time, a sharp peak, and a rapid decline. Compound B gives a tensile-strength curve that rises and remains at a maximum over nearly the whole ninety minutes. In other words it has a flat curing curve. Each accelerator gives to such a type of compound its own characteristic curing curve. Similar curves can be drawn to show the effect at several temperatures, when the time of cure remains constant.

Inhibiting Oxidation

The development of organic accelerators which give a flat curing curve for a compound has great significance in the field of engineering, because it makes it possible to vulcanise thick masses of rubber without risk of overcuring the outside portions to cure the inside portions properly. In other words, when a temperature is selected which is in harmony with the characteristics of a desirable accelerator then thick masses of rubber can be vulcanised with the certainty of uniform physical properties throughout the product. Because of the low thermal conductivity of rubber and the fact that the vulcanisation reaction is exothermic, it is customary, when a large volume is vulcanised, to raise and lower the temperature gradually over a long period of time.

The older rubber compositions in which only inorganic materials were used possessed not only the irregularities mentioned, but also one further trouble, against which the rubber manufacturer found it necessary to be constantly on the alert. It was not unusual for rubber products to become hard, brittle, and weak after but a few months. This decay is now known to be an oxidation reaction.

About 1918 there began to be used in the rubber industry certain organic compositions which possessed the property of inhibiting the oxidation of vulcanised rubber. Apparently it is not definitely known who was responsible for the first use of these antioxidants. A large number of such substances are in customary use and the problem of rapid ageing of vulcanised rubber is conquered. There is only one exception to be made to this statement. It is not yet known how to protect vulcanised rubber from the deteriorating action of sunlight, although a properly mixed composition will remain in good condition in the sun for much longer periods of time than in the earlier days of twenty or more years ago.

From the beginning of the industry dry powders have been used in rubber mixtures to stiffen or to reinforce the product. About 1915, carbon black, a dry soot from the incomplete combustion of natural gas, began its spectacular career as a means for the reinforcement of tyre treads against abrasive wear. Since 1920 much research has been undertaken and published[3] upon the effect of many reinforcing agents upon the stress-strain properties of vulcanised rubber. These substances are of especial interest to the engineer, because pure gum vulcanised rubber is highly extensible and its deformation under load is great. On the other hand, compositions which contain certain dry powders in some volume, show stress-strain curves which have a small angle with the axis of stress. Thus vulcanised rubber compounds may have a low or high modulus or any desired intermediate value.

Adhesion of Rubber to Metal

So far as the engineering uses of rubber are concerned, one other discovery is significant. Rubber has been attached to metal for many years. Yet up to about fifteen years ago no reliable method of obtaining high values of adhesion between soft vulcanised rubber and metal had been found. There were, to be sure, several schemes in common use. The most usual one, if steel were the metal, consisted of cleaning it, of copper or brass-plating it, laying against the brass a thin sheet of a composition which would vulcanise as hard rubber or ebonite, and building against that the soft rubber desired. Then the whole construction was vulcanised together. The weakness in this system was that hard rubber required, and still does, a long period for vulcanisation. It was, therefore, practically impossible to obtain these uniform soft-rubber products attached to a uniform hard rubber. One or the other of these two types of rubber suffered in quality.

In 1923 it was found that certain chemical substances, when mixed with rubber and heated, transformed the rubber hydrocarbon into another hydrocarbon of the same chemical composition, but with a different structure. This changed material is known as a rubber isomer, and it possesses a peculiar property of marked adhesion to clean steel. Since this rubber isomer or "Thermoprene," as it is called, is not vulcanised, it has become possible to attach vulcanised rubber to steel with a high degree of physical adhesion or to vulcanise to it any soft rubber composition that might be desired. However, this method of obtaining adhesion possesses a temperature limit above which the isomer softens. Some of the rubber derivatives seem to show promise of development for their adhesive properties.

The period of rubber history from 1918 to the present time has been one of broadening our knowledge of both the chemistry and physics of vulcanised rubber. A large amount of work has been done in the field of the theories of rubber structure, and there has been much research to discover what rubber vulcanisation really is, to find out why finely divided powders work as they do, and to study the effects of chemical substances which act as accelerators of vulcanisation and inhibitors of oxidation. So to-day, the state

of our knowledge of rubber is of a high order. A rubber composition or compound is subject to exact definition and is reproducible as to properties, whether the mass be small or large. A great mass such as a cube of three or more feet has never been vulcanised simply because no use has ever been found for it.

If, however, you were to call on the rubber industry for a block of vulcanised rubber of the size mentioned, with dimensions and properties from centre to surface within reasonable tolerances, the industry would meet such a specification.

Limiting Physical Properties

The limiting physical properties of rubber are several. Its tensile strength is not high when compared with that of metals, and for individual articles it must be supported either by cotton, as in the case of tyres, or by steel, as in the case of the rubber springs now in use on trolley cars. Its extensibility is large, its elasticity is high, it has abrasive resistance to any other known substance, and it absorbs water but little. It is, however, affected by oil, hydrocarbon oils particularly, which it absorbs and by which it is swollen and weakened. Its physical properties do not vary greatly at temperatures within ordinary atmospheric limits, but above and below that range, temperature effects are notable.[6] [7] No catalogue of the properties or limits of serviceability of vulcanised rubber is advisable here.

The present-day knowledge of rubber is sufficiently exact to lead engineers to have confidence in it as a material wherever its peculiar physical properties warrant its use. One reference,[8] lists 8206 alloys and gives their compositions and use. Gillett and Mack[9] discuss the various metallic elements entering into this one group of alloy steels alone, and they show, as you well understand, how the proportions of the several metals vary and how small proportions have pronounced effects upon the properties of the resultant alloy.

Quite a complicated subject is the alloy field, at least from the standpoint of the rubber chemist. So, I can see relatively little difference in complexity between alloy steels and vulcanised rubber compositions, except that organic accelerators in their effect upon vulcanisation classify themselves somewhat more simply. To be sure, in the field of rubber we have no phase-rule diagrams or photomicrographs to explain the values of carbon black and other ingredients. Rubber is a colloid, and the utility of the organic substances which we use does not depend upon crystal relationships. The fact that rubber requires heat in order to bring it to the desired physical properties means that from the manufacturing standpoint this material is not very different from metallic alloys with which heat-treatment plays such a marked and essential part.

Much Research to be Done

The advances made during the past twenty years have been largely in the chemistry and physical properties of rubber, but application of the product has been confined to relatively small articles. Much research work needs to be done before engineers will be possessed of sufficient data and knowledge of rubber to permit them to design vibration- and shock-absorbing parts for large machines without test by trial and error. The data that we now have are from tests performed upon small pieces, and there is need for research work to permit a translation of small-piece data to terms of large-scale installations. Such progress as has been made in mounting automobile motors upon rubber blocks, in using rubber springs for automobiles and trolley cars, and in supporting heavy machinery, for vibration absorption is of a character pointing rather to the fertility of this field of investigation than indicating a fully developed science.

The time, however, has come when the engineer should take up the study of vulcanised rubber and upon an engineering scale, for until rubber research is graduated from the stage of small test pieces, no great progress can be made. The history of alloys, cement, and other structural materials shows that the engineer has always been counted on to carry out large-scale investigations and applications. So in rubber the responsibility is upon him in the laboratories of technical schools or industrial plants, to conduct research and make practical use of vulcanised rubber—a highly valuable engineering material.

REFERENCES.

[1] "Rubber Cushioning Devices," by C. F. Hirshfeld and E. H. Piron, *Trans. A.S.M.E.*, 1937, **59**, 471.

[2] "Rubber in Automobiles," by C. Macbeth, *India Rubber Journal*, 1938, **95**, 597.

[3] "Rubber Mountings for Large Industrial Machines," by S. Hahn. *Product Engineering*, 1937, **8**, 59 and 96.

[4] "Chemistry and Technology of Rubber," edited by C. C. Davis and J. T. Blake, Reinhold Publishing Corp., New York, 1937. "The Physics of Vulcanized Rubber," by W. W. Vogt, chap. 10, p. 332.

[5] *Ibid.* "Fillers and Reinforcing Agents," by N. A. Shepard, J. N. Street, and C. R. Park, chap. 11, p. 380.

[6] "Tensile Properties of Soft Rubber Compounds at Temperatures Ranging From −70° C. to +147° C.," by R. F. Tener, S. S. Kingsbury, and W. L. Holt, U.S. Bureau of Standards, *Journal of Research*, 1928, **22**, 367.

[7] "The Effect of Temperature on the Stress-Strain Properties of Vulcanised Rubber," by A. A. Somerville and W. H. Cope, *India Rubber World*, 1928, **79**, 64.

[8] "Engineering Alloys," by N. E. Woldman and A. J. Dornblatt, American Society for Metals, Cleveland, 1936.

[9] "Molybdenum, Cerium and Related Alloy Steels," by H. W. Gillett and E. L. Mack, American Chemical Society Monograph series, Chemical Catalog Co., New York, 1925.

Durazol Dyestuffs

Fast-to-light Direct Dyestuffs for Viscose Rayon

A NEW colour card, issued by Imperial Chemical Industries, Ltd., presents the fast-to-light direct dyestuffs sold under the brand name Durazol. The dyestuff is made into a paste with cold water and then dissolved by the addition of boiling water. Condensed water is the most satisfactory for the purpose. Hard water should be boiled with the addition of a small quantity of soda ash before use.

Durazol dyestuffs are applied to viscose rayon by dyeing at temperatures of 85°-95° C., Glauber's salt or common salt being added to promote exhaustion. Excessive amounts of these assistants should be avoided, especially in cases where levelling may present difficulties. The addition of soap, Turkey Red Oil, Calsolene Oil HS or Lissapol LS Paste facilitates level dyeing and contributes to the softening of the material. Certain Durazol dyestuffs can be supplied in qualities suitable for the non-staining of acetate rayon in mixed goods. These special qualities are designated by the prefix "CR" and include: CR Durazol Fast Yellow GS, CR Durazol Fast Orange 2GS, CR Durazol Red 2BS, etc.

In the present colour card, every precaution has been taken to make the classification in the table as accurate as possible, but it must be pointed out that, since it is impossible to test for fastness under all the conditions which obtain in practice, the value of the tables is limited to service as a guide to the dyer in the search for dyestuffs to meet his particular need. In view of the lack of common agreement on standards of fastness, however, customers are recommended, in those special cases in which a particular fastness property is of prime importance, to make tests on their own material, under their own conditions. Degrees of fastness and conditions of dischargeability are indicated for 28 dyestuffs of the Durazol series.

REPORT OF THE I. G. FARBENINDUSTRIE

THE annual report of the I. G. Farbeindustrie, shows that business for 1937 amounted to only 387,000,000 RM against 1,410,000,000 RM in 1929. Sales have been constantly decreasing during the past decade, due to the improving organisation of the French and English chemical firms, who are now able to compete on a more equal footing than in the past. The capital of the I. G. Farbenindustrie is 1,000,000,000 RM, and about 180,000 persons are employed.

An Improved Gas Generator

Laboratory Apparatus Giving Steady, Continuous Gas Flow

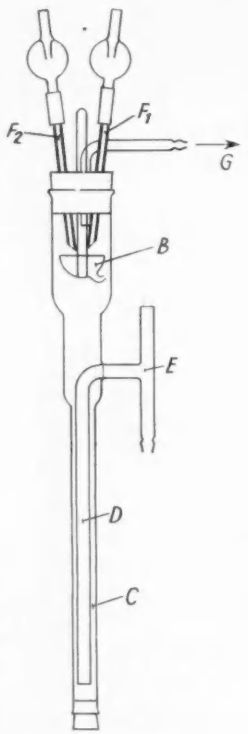
THE classical forms of Kipp's and other gas generators all suffer from the difficulty of maintaining a steady stream of gas, and the apparatus described here was designed to overcome this defect and to give an unvarying output over long periods. Actually, it has also other advantages such as automatic self-emptying and safety valve actions.

The apparatus is as shown in the diagram, the gas being generated by the interaction of two liquid feeds. These come from separating funnels or large aspirator bottles, *via* drop sight glasses and taps or screw clips to regulate the feed, and are admitted to the apparatus by the semi-capillary feed tubes, F_1 and F_2. The use of semi-capillary tubing prevents air-locking and consequent loss of effective head. The reagents mix in the glass bowl B and spill over into the body of the generator, the gas evolution being completed here. The gas formed leaves the generator by the tube G, and the liquid effluent drops down the tube C (which is fitted with a rubber bung for ease in cleaning) and is automatically discharged by the smaller concentric tube D. The exit to this, E, is a T-piece with one arm open to the air so as to prevent any syphoning action.

Gas Pressure and Output

The liquid levels in the concentric tubes C and D adjust themselves to the gas pressure, and outputs of some 30 litres per hour are attained before the pressure blows the 25 cm. lute formed by these tubes. C and D may also be arranged as a U-tube instead of being concentric, but this gives a less compact and robust apparatus. The lute also acts as a safety valve.

From the table below, it will be seen that a wider range of gases may be made in this apparatus than in the Kipp's generator, hydrogen seeming to be the only important impracticable gas. The reservoirs for the liquid feeds need not always be large; thus while 1 litre of 2N sodium carbonate gives some 25 litres of carbon dioxide, 1 litre of 85 per cent. formic acid will give some 400 litres (80 per cent. yield) of the monoxide. By using mixed solutions mixed gases may be obtained; thus a solution containing equimolar quantities of sodium carbonate and sulphide will give a gas of steady composition 50 per cent. CO_2 50 per cent. H_2S. It is well to add a little indicator to one of the solutions to ensure excess acid in the effluent.



Gas.	*Liquid Feeds.*
O_2	H_2O_2, acid $KMnO_4$.
CO	85 per cent. formic acid conc.H_2SO_4.
CO_2	Na_2CO_3, dil.H_2SO_4.
HCl	conc.HCl, conc.H_2SO_4.
Cl_2	NaOCl, 50% H_2SO_4.
H_2S	Na_2S, dil.H_2SO_4.
SO_2	Na_2SO_3, conc.H_2SO_4.
HCN	40% NaCN, 70% H_2SO_4*.

* *Conc.H_2SO_4 gives some CO as impurity.*

(*Continued at foot of next column.*)

Recent Trade Literature

HAUGHTON'S METALLIC CO., LTD., are now issuing a new series of photocards relating to valves for chemical plant, in particular valves for sulphuric acid, acid liquids and alkalis. This is a new form of publicity and the method of reproducing the illustrations leaves little to be desired in the matter of showing up minor details of construction.

ROBEY AND CO., LTD., have recently published a new general catalogue (No. G 693) which describes their full range of standard products. Section 4 which deals with boilers and welded work, and Section 9 which deals with alloy castings, should be of interest to chemical works. This catalogue is fully illustrated and all dimensions for different engines and machinery are given in detail.

SOFNOL, LTD., have now issued a revised edition of their booklet on calcium hydrate. When used for water softening this material does not make it necessary to heat the water, as reaction takes place in the cold and the calcium immediately combines with any free carbonic acid and keeps the carbonates of lime and magnesia in solution. All temporary hardness is at once destroyed, but as most waters contain permanent as well as temporary hardness, soda ash as well as calcium hydrate has to be employed to soften the water effectually.

The treatment of water can be automatically controlled by the automatic Chloronome described in a leaflet of the PATERSON ENGINEERING CO., LTD. These Chloronomes are venturi-controlled and are installed in hundreds of waterworks throughout the Empire. Fluctuations in the flow of water result in the discharge of a proportional volume of chlorine gas, which is lead through a moisture seal to the absorption tower or injector by which it is fed into the water. The rate of flow of chlorine at any moment is read on the scale of a specially sensitive manometer.

In all works a proper consideration of floors is just as necessary as the choice of machinery of trucks. Modern methods of production make much heavier demands upon floors, because output is greater and internal transport is heavier and also faster. Suggestions for laying steel-clad flags and anchor steel plates, as supplied by STELCON (INDUSTRIAL FLOORS), LTD., are given in a new catalogue, wherein there are many illustrations of such floors shown under actual conditions of usage. One illustration shows such a floor successfully resisting the wear and tear of a number of portable kneading vats which have to be moved about freely so that each one, in turn, can be placed beneath a single kneading mechanism.

A new illustrated catalogue of the NATIONAL FIRE PROTECTION CO., LTD., shows that fire-fighting appliances have now reached a very high stage of perfection. This catalogue deals with appliances of simple type such as the soda-acid extinguishers, trailer fire pumps, and also extinguishers in which methyl bromide is used as the fire damping medium. There is also a wide range of extinguishers which generate foam. On page 10 an inflammable vapour detector is described. This detector is said to be especially suitable for indicating concentrations of inflammable gases well below the lower limits of explosive mixture. Two types are made, one being suitable for petrol vapour and most hydrocarbon gases, and the other for inflammable gases which are lighter than air, e.g., hydrogen.

(*Continued from preceding column.*)

Gas efficiencies are high, but in some cases this depends on the use of the strong acids specified, as these give a hot effluent and consequently good elimination of the gas. In the case of HCN it is best to use a carrier gas to avoid the easy condensation of undiluted HCN vapours: this may be nitrogen, etc., from a cylinder, or CO_2 generated *in situ* by using a mixed carbonate-cyanide feed.

E. MARSHALL MEADE, PH.D., A.R.C.S.

Foreign Chemical Notes

Poland

A NEW FACTORY OF THE KALI CO., of Lemberg, will produce potassium sulphate, magnesia and magnesium sulphate.

Sweden

EXPERIENCE GAINED IN TRIAL PLANTINGS OF SOYA BEAN, especially in Southern Sweden, leave little doubt that the plant will be successfully grown on an extensive scale in certain regions.

Russia

WASTE PYRITES ARE BEING UTILISED IN THE MANUFACTURE OF COPPER SULPHATE by a process on which trials have been proceeding for several years. An experimental plant at the Dorgomilooski Chemical Works is in successful operation.

Germany

IN THE NEW PLANT OF THE KRUPP-TREIBSTOFF G.m.b.H., now in course of construction, the Fischer-Tropsch-Ruhrchemie hydrogenation process will, for the first time, be operated in conjunction with low-temperature coke production from anthracite. This will mean a 20 to 30 per cent. higher yield of oils than is obtainable when using high temperature coke as the raw material for synthesis.

Hungary

INVESTIGATION OF THE SUITABILITY OF FERRUGINOUS BAUXITE as a source of iron has now been proceeding for some time at the state-sponsored experimental plant at Pét. A patent application covering the smelting of bauxite has now been filed by the Ministry of Industry and it is believed that large-scale production of iron by this method will be undertaken in the near future. Over 100 million tons of excellent raw material are available in the Tapolca region.

Italy

A BLEACHING EARTH MADE FROM ITALIAN RAW MATERIALS is being produced in a new factory of the Litacrom S.A. at Marghera.

GLYCOL ESTERS AND POLYSTYROL are among the materials to be produced at the new plant of the Vetrocoke S.A. of Milan at Porto Marghera.

PLANS HAVE BEEN APPROVED for construction of a phthalic anhydride plant at Scanzo Rosciate (Bergama) by the Fabbrica Lombarda Colori Anilina of Milan.

B.S. SPECIFICATION FOR METHODS FOR TESTING GLUES

THE British Standards Institution has just issued a revision of the "British Standard Methods for Testing Glues" (Bone, Skin and Fish Glues) (B.S S. No. 647-1938)." This standard includes methods for the determination of the following properties of glue:—moisture, jelly strength, viscosity, melting point, foam, water absorption, keeping quality, joint strength in shear, reaction (*p*H), grease, ash, chloride and sulphur dioxide.

It is pointed out in the foreword that all these tests provide indications of the behaviour of the glue in use, but which ones are of particular importance will depend on the purposes for which the glue is intended; for example, the joinery trade is particularly interested in joint strength in shear, and the foam test is of interest when the glue is to be applied by special machines, etc. These methods have been prepared by a representative committee under the chairmanship of Mr. R. Duncalfe, and they have been revised and brought up to date, and a section for the method for sampling has been added. Stress is laid on the importance of following the methods in full detail in order to obtain reliable results.

Copies of this standard may be obtained from the Publications Department, British Standards Institution, 28 Victoria Street, London, S.W.1, price 3s. 6d. (3s. 9d. post free).

Personal Notes

SIR GILBERT MORGAN, F.R.S., received the honorary degree of LL.D. of St. Andrews University at the autumn graduation ceremony held at St. Andrews on October 7.

PROFESSOR A. R. TODD succeeds Professor Heilbron in the Sir Samuel Hall Chair of Chemistry and as Director of the Chemical Laboratories at Manchester University.

PROFESSOR G. F. J. TEMPLE, D.Sc., Ph.D., has been elected a representative of the Faculty of Science on the Senate of London University in place of Professor J. C. Philip.

LORD MCGOWAN and Imperial Chemical Industries have each donated £1,000, and VISCOUNT LEVERHULME £250, to the Lord Mayor of London's fund for Czech refugees.

PROFESSOR F. G. DONNAN and PROFESSOR A. C. G. EGERTON have been appointed scientific representatives in respect of chemistry for the Scientific Advisory Committee of the Trades Union, on advice furnished by the British Association. Other scientific representatives include Professor J. D. Bernal (metallurgy) and Professor Allan Ferguson and Professor P. M. S. Blackett (physics).

Dr. C. G. Darwin, M.C., Sc.D., F.R.S., who, as announced last week, has been appointed director of the National Physical Laboratory, Teddington.

DR. HAROLD J. PLENDERLEITH has been appointed deputy keeper in charge of the research laboratory attached to the British Museum, where chemical and physical investigations are conducted upon the subject of preserving antiquities. He succeeds Dr. Alexander Scott, who has been honorary director of the laboratory since its institution, under the Department of Scientific and Industrial Research, in 1919.

MR. HERBERT W. GARTRELL has been appointed to the new professorship of metallurgy, in association with mining, at Adelaide University. For several years he has been head of the mining and metallurgical department at the Adelaide School of Mines and has supervised ore dressing research at the Bonython Laboratory under arrangements with the Australian Council for Scientific and Industrial Research.

MR. GEORGE SCHICHT, the Czech soap manufacturer, who is a director of Lever Brothers and Unilever, Ltd., and his three sons, two of whom are associated with Unilever, Ltd., are applying for British naturalisation. Mr. Schicht controls the large soap and candle concern on the banks of the River Elbe, at Aussig, Czechoslovakia, where he was born. He has lived in England for about eight years and resides at Buckhurst Park, Withyham, Sussex, the family seat of Earl De La Warr.

References to Current Literature

Inorganic

Effect of alkalinity and impurities on the stability of calcium hypochlorite. Connor, *Paper Trade J.*, *107*, No. 10, 40-41.

Alumina and barium compounds from barium aluminate. Akiyama, Kajima and Aiba, *J. Soc. Chem. Ind. Japan*, *41*, 218-219 B.

Carbonaceous zeolite in water softening. Riley, *Paper Trade J.*, *107*, No. 11, 74-81.

Magnesium metal and compounds. Manning, *Chem. Met. Eng.*, *45*, 478-482.

Catalytic oxidation of ammonia on platinum and on oxidising catalysts. v. Nagel, *Z. Phys. Chem.*, *B*, *41*, 71-74.

Scaling of boilers: control of calcium sulphate deposition by the phosphate ion. Clark, Gerrard and Hunter, *J. Soc. Chem. Ind.*, *57*, 295-302,

Organic

Thermal decomposition of hydrocarbous. Hobbs and Hinshelwood, *Proc. Roy. Soc.*, *167*, A, 447-455.

Thermal decomposition of hydrocarbons. Hobbs, *Proc. Roy. Soc.*, *167*, A, 456-463.

Vanillin from wood. Thomas, *Manuf. Chem.*, *9*, 279-281.

Ethylene chlorhydrin and ethylene glycol. Ueno and Takase, *J. Soc. Chem. Ind. Japan*, *41*, 254-256 B.

Aerobic formation of citric acid from acetic acid by yeast. Sunderhoff and Deffner, *Annalen*, *530*, 36-43.

Derivatives of 2,3-dimethyl naphthalene. Coulson, *J.C.S.*, 1938, 1,305-1,310.

Catalytic dehydration. Chatterjee, Sanyal and Goswami, *J. Indian Chem. Soc.*, *15*, 399-401.

Substitution in the benzene nucleus. McGowan, *Chem. and Ind.*, *57*, 933-934.

Analysis

Colorimetric determination of phosphate in boiler water. Wilkinson, *J. Soc. Chem. Ind.*, *57*, 292-295.

Quantitative determination of carbon and nitrogen in organic compounds. Pentscheff, *Z. analyt. Chem.*, *113*, 431-437.

Determination of small quantities of selenium. Hirano, *J. Soc. Chem. Ind. Japan*, *41*, 266-267 B.

Artificial resin analysis. Esch, *Kunststoffe*, *28*, 226-227.

Analysis of organic accelerators. Robinson, *Inst. Rubber Ind. Trans.*, *14*, 49-64.

Chemical analysis by X-ray diffraction. Hanawalt, Rinn and Frevel, *Ind. Eng. Chem. analyt. ed.*, *10*, 457-512.

Determination of water in alcohol. Botset, *Ind. Eng. Chem. analyt. ed.*, *10*, 517-518.

Determination of ortho, pyro, and metaphosphoric acids. Gerber and Miles, *Ind. Eng. Chem. analyt. ed.*, *10*, 519-524.

Precipitation of cadmium and its separation from zinc. Zöllner, *Z. analyt. Chem.*, *114*, 8-14.

Mineral Oils, Gas, Tar

Oxidation of mineral transformer oil. Clark, *Petroleum World*, *35*, 168-169.

Stabiliser for gasoline-alcohol blends. Tanaka, Kuwata and Aoki, *J. Soc. Chem. Ind. Japan*, *41*, 226-227 B.

Determining and calculating the combustion temperature of gas. Riband, *Gas u. Wasserfach*, *81*, 661-666.

Refining of shale oil. Smith and Pentherer, *J. Inst. Petroleum Techn.*, *24*, 513-536.

Mercaptan and hydrogen sulphide removal by caustic scrubbing. Albright, *Refiner*, *17*, 437-440.

Constitution of coal: oxidation of coal humic acids. Morgan and Jones, *J. Soc. Chem. Ind.*, *57*, 289-292.

Cellulose, Paper

Cellulose hydrate conversion in natural celluloses. Kubo and Kanamaru, *Z. Phys. Chem.*, *A*, *182*, 341-360.

Hardwood pulping for viscose. Carpenter and McCall, *Rayon Text. Monthly*, *19*, 538-539.

Softening of cellulose foils treated with aluminium soap solutions. Kanamaru, Shiratori and Nakamura, *Kolloid Z.*, *84*, 323-334.

Bleaching, Dyeing, Finishing

Continuous processing in viscose manufacture. Volbrath, *Rayon Text. Monthly*, *19*, 544-546.

Waterproofing cotton duck and canvas. McLain, *Amer. Dyestuff Rep.*, *27*, 507-517.

Drying of cakes in rayon manufacture. Duncans, *Rev. Univ. Soie Text. Art.*, *13*, 301-305.

Experiences with acetate silk dyestuffs. Herrmann, *Seide u Kunstseide*, *43*, 365-368.

Cellulose wool research. Weltzien, *Seide u. Kunstseide*, *43*, 388-392.

Glass, Ceramics

Effect of sulphur, selenium and tellurium in glass. Dietzel, *Glastechn. Ber.*, *16*, 292-296.

Changing the transparency of glass to ultraviolet light. Düsing and Zincke, *Glastechn. Ber.*, *16*, 287-292.

Metals, Electrometallurgy

Vanadium in steel and iron. Priestley, *Metals and Alloys*, *9*, 237-241.

Thermal reduction of zinc blende and the condensation of zinc. Grillo, *Metall u. Erz*, *35*, 475-480.

Hard chromium plating. Krämer, *Metallwaren Ind. u. Galvano-Techn.*, *33*, 411-422.

Formation of surface oxide layers. Winkel and Haul, *Z. Elektrochem.*, *44*, 611-619.

Electrodeposition of lead on base metals. Joshi and Rao, *J. Indian Chem. Soc.*, *15*, 377-382.

Corrosion tests on the steel base of tinplate. Rhodes, *J. Soc. Chem. Ind.*, *57*, 315-319.

Fats, Oils, Waxes

Rapid determination of moisture. Freyer, *Oil and Soap*, *15*, 236-239.

Fractional crystallisation of fat mixtures. Hinko, *Ole Fette Wachse*, 1938, No. 8, 1-3.

Effect of free and hydrolysed alkalies. Welwart, *Ole Fette Wachse*, 1938, No. 8, 3-6.

Saturated acids of completely hydrogenised oils. Ueno and Iwai, *J. Soc. Chem. Ind. Japan*, *41*, 256-257 B.

Essential oil of eucalyptus. Penfold and Morrison, *Perfum. Essential Oil Rec.*, *29*, 338-339.

Paints, Pigments, Resins

Determination of fineness of zinc oxides by surface wetting. Mueller, *Rubber Age (U.S.A.)*, *43*, 363-364.

Lacquer formulation: factors affecting solvent-diluent blend. Martin, *Paint Manuf.*, *8*, 279-282.

Undercoatings. Remington, *Paint Manuf.*, *8*, 293-294.

Manganese compounds and pigments. Lambrecht, *Farben Chem.*, *9*, 293-294.

Varnish and paint removers. v. Artus, *Farben Chem.*, *9*, 294-296.

Rubber, Plastics

Chemical resistance of modern thermoplastics. Kollek, *Kunststoffe*, *28*, 231-233.

Determining the water permeability of artificial foils. Jenckel and Woltmann, *Kunststoffe*, *28*, 235-238.

Polyvinyl acetal resins. Berthsen, *Rev. Général Matières Plastiques*, *14*, 210-213.

New synthetic resins and derivatives. *Paint Techn.*, *3*, 317-320, 323.

Miscellaneous

Preparation, properties and applications of active wood charcoals. Berthelot, *Rev. Chim. Ind. Quesneville*, *47*, 227-231.

Nature of foam. Sasaki, *Bull. Chem. Soc. Japan*, *13*, 517-526.

From Week to Week

A SUGGESTION has been made that Glasgow Corporation should take over the Empire Exhibition, and re-open it next year as a Scottish Industries Fair.

THE FIFTIETH ANNIVERSARY of the foundation of the Pasteur Institute of Paris will be celebrated on October 26, in the presence of the President of the French Republic.

CANADIAN GYPSUM PRODUCTION during the first half of 1938 totalled 330,607 tons ($565,485), as compared with 377,198 tons valued at $648,250 during the first six months of 1937.

MINERAL PRODUCTION in India last year increased by 36.1 per cent. over that of the previous year, representing an additional value of £4,275,000. Coal, manganese, mica, copper, iron and petroleum showed the greatest increases.

THE GLASGOW DEAN OF GUILD COURT has passed the plans of Williamson, Morton and Co., Ltd., paint manufacturers, to carry out a scheme of alterations and additions to their premises in Dobbie's Loan, Glasgow.

KINTYRE AND JAPANESE SEAWEED has been analysed in London to see which has the greater iodine content. The news has revived hopes that the once flourishing kelp industry may be revived on a small scale in the highlands of Scotland.

TENTATIVE INQUIRIES are to be made by Hednesford (Staffordshire) Chamber of Commerce with a view to inviting a Czechoslovak firm of glassmakers to set up a factory in the district. Hednesford contains large areas of sand, much of it suitable for the manufacture of glass.

A LECTURE, illustrated by about 60 lantern slides, has been prepared by Barimar, Ltd., describing noteworthy repairs that have been carried out by scientific welding processes to industrial machinery, etc. The slides, with complete manuscript for lecture, are available on loan, without charge, to technical colleges, societies, etc., on application to the company.

THE FORMATION OF THE AIR RAID PROTECTION INSTITUTE was announced at a meeting of the Royal Society of Arts on Tuesday. The object of the new institute was to provide a forum for the discussion of the both complicated and urgent technical problems of A.R.P. The institute would grant the qualifications of Fellow and Associate-Fellow to those who reached the appropriate standing through study and experience.

THE DEPARTMENT OF OVERSEAS TRADE announces that free passport visas valid for three months, will be given, where these are required, to all *bona-fide* overseas buyers visiting the 1939 British Industries Fair, which opens in London and Birmingham on February 20. Among the countries to which the concession is made are Germany (including Austria), Russia, China, Japan and Ethiopia.

GREATER IMMUNITY FROM POSSIBLE AIR RAIDS is believed to be one of the causes of an increase in the demand for factories on the Treforest (Cardiff) Trading Estate, one of the three Government-aided schemes for attracting new industries to the Special Areas. Four factories were completed during September and the total number of people employed in the factories on the Estate increased by 163 in the course of a month to 682.

THE PROCEEDINGS of the Symposium on steelmaking which was organised by the Iron and Steel Institute in conjunction with its annual meeting on May 4 and 5 have now been published; consisting of 23 papers and the discussions on eight selected aspects of steelmaking practice by the acid and basic open-hearth process with a bibliography, the report constitutes the twenty-second volume in the special report series of the Institute. The price of the volume is 10s., and members and associates of the Institute are entitled to one free copy in respect of their membership for 1938.

THE EXPLOSION in a mixing house at Imperial Chemical Industries, Ltd.'s factory at Ardeer, Ayrshire, must be regarded as an accident says Mr. H. E. Watts, Inspector of Explosives, in his report issued by the Home Office on October 8. The report states that the inspector is of the opinion that of possible causes of the accident two were more probable than the others. One was a glancing blow struck by a box of explosive against a mixer, and the other the dropping of some article into the mixer. Of these, the inspector considers the former more probable. He did not think that any blame could be attached to anyone.

THE DEVELOPMENT OF TWO NEW INDUSTRIES IN NEW ZEALAND will begin this month according to information just issued by the Dominion Bureau of Industry. The Government has granted to a Melbourne company rights to work manganese deposits in the Bay of Islands. The deposits, which are in a lode 100 feet wide, extending 300 feet up the side of a hill, have not been previously worked. A contract has already been placed for 50,000 tons of the ore. The other industry, for the manufacture of asbestos cement, is the result of discoveries of extensive asbestos deposits in mountainous districts in the South Island. Licences have been granted to two New Zealand companies to work the deposits.

THE UNILEVER GROUP has acquired a controlling interest in a Swedish margarine producing company, Aktiebolaget Linkoepings Margarinefabrik. The company has a capital stock of Kr.300,000 and was founded in 1935.

THIRTY-SIX PROSPECTING LICENCES for oil were granted in England and Scotland last year for areas aggregating 5,659 miles. A report of the petroleum department of the Mines Department states that a total depth of 19,588 feet was drilled in ten test boreholes and 1,720 feet in six shallow exploratory information boreholes. Geological surveys were carried out over areas totalling 1,940 square miles and geophysical surveys over areas amounting to 1,751 square miles.

THE SHIPMENTS OF CHINA CLAY in Cornwall during September showed a substantial recovery of trade. Over 50,000 tons of china clay were shipped at Fowey, which is by far the largest volume despatched from that port for the year. 5,627 tons were sent direct by rail. The total business for last month is as follows: 69,964 tons of china clay; 3,017 tons of china stone; 3,307 tons of ball clay; an aggregate tonnage of 76,288 tons compared with 85,249 tons for the corresponding month in the record year of 1937.

TO COMMEMORATE THE CENTENARY OF THOMAS MOSCROP AND CO., LTD., oil refiners and chemical manufacturers, of Bolton, the company has issued an illustrated leaflet setting out the dates of importance in its history, the names of the present directors and their associates, and the specialities produced. Employees were entertained at a celebration party given by the company at the Co-operative Hall, Bolton, on Tuesday evening. During the evening a presentation from his fellow-workers was made to Mr. W. Wyer, who was retiring on pension after 44 years' service.

DURING THE PAST FEW WEEKS further production tests have been carried out on the well drilled by the Anglo-American Oil Company at Dalkeith, Midlothian. Four sands from 2,000 feet to 2,152 feet gave a combined natural gas production of 5,000,000 cubic feet per day, with a shut-in pressure of 700 lb. per square inch. These sands were temporarily plugged off, and a further test was conducted on the oil sands at 1,750 feet. Over a five day's period the rate of production averaged 8 to 10 barrels of oil per day. The well is now shut down, awaiting the delivery of special oil well puming equipment.

MR. J. W. WRIGHT, director of Evans, Sons, Lesched and Webb, Ltd., in the course of an address to the Liverpool Branch of the Industrial Transport Association of which he is chairman, said that distribution costs were rising steeply owing to the almost insane demand for frequent deliveries, which in effect, meant that the manufacturer had taken the responsibility for the retailers stock-keeping. A technique of costing was growing up and traffic management was becoming increasingly technical. Detailed knowledge was being gradually built up but it lacked direction and co-ordination and it was regarded as a secret by the firms obtaining it. Efficient transport was not an expense but an economy.

THE ANNUAL REPORT OF THE BIRMINGHAM CITY ANALYST on the work carried out in the City Laboratory during the year 1937, states that during the year, 6,741 samples were submitted for analysis. Of these, 5,613 were taken in connection with the Sale of Food and Drugs Acts, while 1,128 were submitted by various Corporation Departments or were analysed in connection with investigations carried out during the year. Of the 5,613 samples taken under the Sale of Food and Drugs Act, 269 (or 4.8 per cent.) were found to be adulterated. This may be compared with the percentage of adulteration for all samples of foods and drugs taken in England and Wales, which in 1936 (the last year for which figures are available) was 5.3 per cent.

Ten Years Back

From "The Chemical Age," October 13, 1928

Mr. Neville Chamberlain, M.P. (Minister of Health), formally opened on Thursday, October 4, the new school of pharmacy at the Birmingham Central Technical College.

* * * *

A large factory for the manufacture of photographic celluloid film base will be built by Kodak, Ltd., at Harrow, Middlesex. Nine buildings will be erected. At present the base is imported from the United States, France and Germany.

* * * *

The principal cement manufacturers in this country have formulated a plan to terminate the price cutting which has been practised for some time. Agreements have been entered into among five important cement manufacturing companies, but it is stated that other undertakings may join the Association.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

METALLIC REINFORCED RUBBER.—G. W. Ayling. 26885.

CONTINUOUS PRODUCTION OF HIGHLY CONCENTRATED NITRIC ACID. Bamag-Meguin, A.-G. (Germany, Sept. 21, '37.) 27414; (Germany, May 16.) 27415.

MANUFACTURE OF ETHYLENE DERIVATIVES.—Boots Pure Drug Co., Ltd., W. F. Short, and H. H. L. Levene. 27554.

TREATMENT OF CELLULOSIC MATERIALS.—British Celanese, Ltd. (United States, Sept. 16, '37.) 27056.

DRYING OF SOLID MATERIALS.—British Celanese, Ltd. (United States, Sept. 23, '37.) 27256.

ALLOYS.—British Thomson-Houston Co., Ltd. (United States, Sept. 17, '37.) 26957.

TREATMENT OF KERATIN-CONTAINING FIBRES.—N. H. Chamberlain, and MacDonald Steam Waving, Ltd. 27164, 27165.

MANUFACTURE OF ABRASIVE ALUMINA.—Chemical Construction Corporation. (United States, Sept. 22, '37.) 27122.

WORKING-UP POLYVINYLACETALS.—Deutsche Celluloid-Fabrik, A.-G. (Germany, Sept. 17, '37.) 27260.

PRODUCTION OF IRON POWDER.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. (Germany, Sept. 23, '37.) 27431.

MANUFACTURE OF MALTASAMINES.—E. I. du Pont de Nemours and Co. (United States, Sept. 21, '37.) 27577.

PREPARATION OF PRESSED PARTS from artificial resin masses.—A. Dynamit, A.-G. vorm., Nobel and Co. (Germany, Sept. 25, '37.) 27379.

MANUFACTURE OF ORGANIC MERCURY COMPOUNDS.—Fahlberg-List, A.-G. (Germany, Sept. 17, '37.) 27259.

PROCESS FOR THE APPARENT SOLIDIFICATION OF LIQUID HYDROCARBONS.—G. Fuardo, and H. Kahn. 27456.

MAGNESIUM ALLOYS.—G. von. Giesche's Erben. (Germany, Sept. 29, '37.) 27010.

MANUFACTURE OF MONO-AZO-DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) 27065.

REFINING HYDROCARBONS.—Gutehoffnungshütte Oberhausen, A.-G. (Germany, Sept. 16, '37.) 27052.

POLYMERISING OLEFINES.—Gutehoffnungshütte Oberhausen, A.-G. (Germany, Sept. 20, '37.) 27378.

METAL ALLOYS.—H. J. Henbrey. 27153, 27204.

CATALYTIC REACTION OF GAS MIXTURES.—Hercules Powder Co. (United States, Jan. 19.) 27525; (United States, Aug. 26.) 27526.

MANUFACTURE OF CARBAZOLE COMPOUNDS.—I. G. Farbenindustrie. (Germany, Sept. 15, '37.) 26973; (Germany, Aug. 22.) 26974.

MANUFACTURE OF DISAZO-DYESTUFFS.—I. G. Farbenindustrie. (Germany, Oct. 7, '37.) 27408.

MANUFACTURE OF AZO-DYESTUFFS.—I. G. Farbenindustrie. (Germany, Oct. 8, '37.) 27409.

PRODUCTION OF N-ALKYL DERIVATIVES of aromatic amines.—I. G. Farbenindustrie. (Germany, Sept. 25, '37.) 27544; (Germany, April 28.) 27545.

METHOD OF PROTECTING METALLIC SURFACES from erosion, etc.—A. Kari, and J. P. Rosenberg. 27530.

PRODUCTION OF POLYVINYL RESINS.—Kodak, Ltd. (United States, Oct. 2, '37.) 27555.

INDUSTRIAL RECOVERY OF RESIDUAL MUDS, ETC., obtained during the manufacture of osseins, etc.—P. Lanthier, and Soc. Anon. des Usines de Produits Chimiques d'Hautmont Nord. (France, July 4.) 27358.

METHOD, ETC., OF TREATING, ETC., SLUDGE in sewage-sludge digestion tanks.—P. A. Leitch, and J. F. Bolton. 27343.

PREPARATION OF NEW THERAPEUTICALLY USEFUL HETEROCYCLIC COMPOUNDS.—May and Baker, Ltd., and G. Newberry. 26963.

CRACKING HEAVY OIL in the vapour phase, etc.—Naamloose Vennootschap Niewe Octrooi Maatschappij. (Holland, Oct. 22, '37.) 27556.

PRODUCTION OF COKE.—Naamlooze Vennootschap Niewe Octrooi Maatschappij. (Holland, Sept. 21, '37.) 27163.

MANUFACTURE OF COMPOSITIONS OF LEAD, ETC.—Richardson Co. (United States, June 27.) 27444.

MANUFACTURE OF NAPHTHALENE DERIVATIVES.—Schering, A.-G. (Germany, Sept. 20, '37.) 27445; (Germany, Sept. 30, '37.) 27446.

MANUFACTURE OF ANHYDROUS BERYLLIUM FLUORIDE free from oxide.—Seri Holding Soc. Anon. (Italy, Sept. 18, '37.) 27123.

METHOD, ETC., OF POLISHING SYNTHETIC RESINS, ETC.—C. F. Smith, and Combined Optical Industries, Ltd. 26965.

MANUFACTURE OF ADHESIVE BITUMENS.—Standard Oil Development Co. (France, Sept. 15, '37.) 26934; (France, Jan. 26.) 26935.

MANUFACTURE OF ADHESIVE BITUMENS.—Standard Oil Development Co. (France, Sept. 15, '37.) 26936.

CHROMIUM ALLOYS, ETC.—M. J. Udy. (United States, Sept. 23, '37.) 26984; (United States, Jan. 22.) 26985; (United States, July 23.) 26986; (United States, Sept. 7.) 26987.

HYDROGENATION OF OCTENES.—Universal Oil Products Co. (United States, Feb. 25.) 27008.

PHOSPHATISATION PROCESSES, ETC.—R. Tempe. 27048.

HYDROGENATION OF ALKALENE OXIDES.—Usines de Melle, and H. M. Guinot. (March 25, '37.) (France, March 28, '36.) 27538.

ELECTRO-DEPOSITION OF ZINC ON MAGNESIUM, ETC.—H. Webb. 26924.

PREPARATION OF COKE.—S. Whyte, and A. E. A. Higginbottom. 27504.

MANUFACTURE OF SINTERED CALCIUM OXIDE.—A.-G. für Stickstoffdünger. (Germany, Sept. 27, '37.) 28095.

FLOTATION OF ANTHRACITE CULM.—American Cyanamid Co. (United States, Nov. 5, '37.) 27739.

MANUFACTURE OF DERIVATIVES OF SULPHONAMIDES.—Boots Pure Drug Co., Ltd., F. L. Pyman, and A. Cohen. 28237.

MANUFACTURE OF CELLULOSE DERIVATIVES.—British Celanese, Ltd. (United States, Sept. 29, '37.) 27643.

ALLOYS.—British Non-Ferrous Metals Research Association, E. A. G. Liddiard, and R. May. 27620.

RESINOUS MATERIALS.—British Thomson-Houston Co., Ltd. (United States, Sept. 24, '37.) 27657.

HEAT-EXCHANGE DEVICES.—H. W. Brownsdon, and Imperial Chemical Industries, Ltd. 27670.

MANUFACTURE OF AZO DYESTUFFS of the stilbene series.—A. Carpmael (I. G. Farbenindustrie.) 27839.

DISTILLATION OF CARBONACEOUS MATERIALS.—J. A. Chown. 27883.

HYDRATION OF VINYL ACETLYENE.—Consortium für Elektrochemische Industrie Ges. (Germany, Feb. 4.) 27881.

PRODUCTION OF NON-DELIQUESCENT POWDERS from synthetic tanning agents.—A. B. Craven. 27966.

MANUFACTURE OF ARYL SUBSTITUTED MONO-OLEFINES, ETC.—Distillers Co., Ltd., H. M. Stanley, and J. B. Dymock. 28212.

POLYMERIC MATERIALS.—E. I. du Pont de Nemours and Co. (United States, Oct. 22, '37.) 28200.

METHOD, ETC., OF HANDLING LIQUID CARBON DIOXIDE.—E. Geertz, and J. E. Taylor. 28198.

PRODUCTION OF FAST DYEINGS.—W. W. Groves (I. G. Farbenindustrie.) 27905.

MANUFACTURE, ETC., OF SYNTHETIC RUBBER-LIKE MATERIALS.—B. J. Habgood, E. Isaacs, L. B. Morgan, and Imperial Chemical Industries, Ltd. 27671.

COATING ALUMINIUM BRONZE.—H. C. Hall, and E. Aspley. 28189.

MANUFACTURE OF LIGHT AND POROUS MATERIALS from substances containing cellulose, etc.—R. Handl, and W. F. Wagner. (Belgium, Sept. 25, '37.) 28000.

MANUFACTURE OF DUROHYDROQUINONE-MONOPHYTYL-ETHER.—F. Hoffman-La Roche and Co., A.-G. (Switzerland, Oct. 1, '37.) 28184.

MANUFACTURE OF AZO-DYESTUFFS.—I. G. Farbenindustrie. (Germany, Oct. 25, '37.) 27637.

MANUFACTURE OF AZO-DYESTUFFS.—I. G. Farbenindustrie. (Germany, April 26.) 27638.

MANUFACTURE OF INDOPHENOL-LIKE COMPOUNDS of the naphthocarbazole series.—I. G. Farbenindustrie. (Germany, April 13.) 27639.

Complete Specifications Open to Public Inspection

METHODS OF IMPARTING DIFFERENT COLORATIONS TO RESPECTIVE AREAS OF A METALLIC SURFACE.—L. Marx, and M. Damien. March 22, 1937. 8842/38.

POLARISING BODIES.—E. Kasemann. March 22, 1937. 8846/38.

FIRE-PROOFING OF COMBUSTIBLE ORGANIC MATERIALS.—E. I. du Pont de Nemours and Co. March 23, 1937. 8964/38.

POLYMERISATION OF DIAMINES.—I. G. Farbenindustrie. March 25, 1937. 9049/38.

TREATMENT OF COPPER.—Metallurgica Bresciana Gia Tempini. March 25, 1937. 9052/38.

PREPARATION OF STEROL OXIDATION PRODUCTS.—Chinoin Gyogyszer es Vegyeszeti Termekek Gyara R.T. March 26, 1937. 9077/38.

PRODUCTION OF POLYHYDROXY-FUCHSONE DERIVATIVES.—Chinoin Gyogyszer es Vegyeszeti Termekik Gyara R.T. March 26, 1937. 9278/38.

METHOD OF MAKING UNIAXIAL LOW SHRINKAGE CELLULOSE DERIVATIVE SHEETING.—Kodak, Ltd. March 26, 1937. 9301/38.

METHOD OF PRODUCTION OF ALLOYS.—Alloys, Ltd. March 26, 1937. 9498/38.

HYDROGENATION OF ALKALENE OXIDES.—Usines de Melle, and H. M. Guinot. March 28, 1936. 27538/38.

Specifications Accepted with Date of Application

PRODUCTION OF PROTEIN ADHESIVES.—J. E. Pollak (International Patents Development Co.). March 18, 1937. 492,654.

PRODUCTION OF PROTEIN FILAMENTS.—J. E. Pollak (International Patents Development Co.). March 18, 1937. 492,655.

PRODUCTION OF MOULDED FIBROUS OR CELLULAR PRODUCTS.—J. E. Pollak (International Patents Development Co.). March 18, 1937. 492,656.

PRODUCTION OF PLASTICISED PRODUCTS.—J. E. Pollak (International Patents Development Co.). March 18, 1937. 492,657.

PRODUCTION OF MOULDABLE PROTEIN PLASTICS.—J. E. Pollak (International Patents Development Co.). March 18, 1937. 492,658.

PROCESS FOR THE MANUFACTURE OF AZO DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) March 18, 1937. 492,528.

PROTECTION OF METALS AGAINST CORROSION.—W. V. Gilbert, and Magnesium Elektron, Ltd. March 20, 1937. 492,445.

TREATMENT OF MATERIALS CONTAINING TANTALUM and/or niobium. W. W. Triggs (Soc. Generale Metallurgique de Hoboken). March 22, 1937. 492,606.

MANUFACTURE OF FERTILISERS.—K. Hosokawa. March 23, 1937. 492,387.

MONO-AZO DYESTUFFS.—A. H. Knight, and Imperial Chemical Industries, Ltd. March 23, 1937. 492,668.

PRESERVATION OF ORGANIC MATERIALS, particularly oils and fats, and bodies containing same.—British Association of Research for Cocoa, Chocolate, Sugar, Confectionery and Jam Trades, T. Macara, W. J. Stainsby and L. E. Campbell. March 23, 1937. 492,714.

SOAP PRODUCTS and the manufacture thereof.—Lever Bros., and Unilever, Ltd., R. Thomas and H. B. Oakley. March 24, 1937. 492,719.

MANUFACTURE OF KETONES of the sterol series.—I. G. Farbenindustrie. March 28, 1936. 492,729.

MANUFACTURE AND PRODUCTION OF CELLULOSIC MATERIALS with improved crease-resisting properties.—Courtaulds, Ltd., T. H. Morton, and J. Boulton. March 24, 1937. 492,449.

MANUFACTURE OF RESINOUS COMPOSITIONS.—Naamlooze Vennootschap Industrieele Maatschappij Voorheen Noury and Van Der Lande. March 27, 1936. 492,700.

METALLISING SURFACES.—R. Bosch Ges. March 30, 1936. 492,681.

ELECTROLYTIC CELL for the production of caustic alkalis and chlorine.—I. G. Farbenindustrie. July 4, 1936. 492,688.

MANUFACTURE OF β-HALOGEN-BUTADIENES-1, 3.—I. G. Farbenindustrie. March 28, 1936. 492,689.

PROCESS FOR THE MANUFACTURE OF α β-UNSATURATED KETONES of the cyclopentanopolyhydrophenanthrene series.—Schering-Kahlbaum, A.-G. March 31, 1936. (Sample furnished.) 492,725.

MANUFACTURE OF KETONES and alcohols from olefines.—Usines de Melle, and H. M. E. Guinot. March 28, 1936. 492,726.

CONVERSION OF OLEFIN HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). March 25, 1397. 492,727.

CONVERSION OF OLEFIN HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). March 25, 1937. 492,728.

MANUFACTURE OF ANTHRAQUINONE DERIVATIVES.—Imperial Chemical Industries, Ltd. March 25, 1936. 492,696.

MANUFACTURE OF ANTHRAQUINONE DERIVATIVES.—Imperial Chemical Industries, Ltd. March 25, 1936. 492,697.

MANUFACTURE AND PRODUCTION OF CONCENTRATED NITRIC ACID and ammonium sulphate.—G. W. Johnson (I. G. Farbenindustrie.) March 30, 1937. 492,392.

PRODUCTION OF HIGH MOLECULAR QUATERNARY AMMONIUM COMPOUNDS.—Farberei-A.-G., Vorm E. Stolte Nachf, and W. Missy. Dec. 4, 1936. (Samples furnished.) 492,699.

REFRACTORY CERAMIC MATERIALS.—General Electric Co., Ltd., and M. Pirani. April 5, 1937. 492,394.

PREPARATION OF NUCLEAR ALKYLATED, ARALKYLATED, ARYLATED DERIVATIVES OF ALKALOIDS of the morphine series.—W. U. Dykes (Research Corporation, L. F. Small, and H. M. Fitch). May 5, 1937. (Samples furnished.) 492,702.

LUBRICATING-COMPOSITIONS for, and lubrication of, textile materials.—British Celanese, Ltd. June 30, 1936. 492,472.

PRODUCTION OF AQUEOUS AND ALCOHOLIC SOLUTIONS OF SULPHUR, or sulphides of arsenic, antimony, or selenium.—W. J. Tennant (H. Mack Nachf). July 1, 1937. 492,412.

DYESTUFFS INTERMEDIATES.—J. W. Leitch and Co., Ltd., A. E. Everest, and J. A. Wallwork. July 2, 1937. 492,476.

COATING METAL ARTICLES.—Interchemical Corporation. August 28, 1936. 492,479.

PRODUCTION OF VALUABLE HYDROCARBON PRODUCTS by destructive hydrogenation of solid carbonaceous materials.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). July 22, 1937. 492,551.

METHOD OF MANUFACTURING NEUTRAL COLLOIDAL CALCIUM CARBONATE.—T. Shiraishi. July 27, 1937. 492,552.

TREATMENT OF MATERIALS CONTAINING METALLIC SULPHIDES.—Norsk Raffineringsverk A/S. Sept. 26, 1936. 492,621.

STABILISING VINYL RESINS against the action of light.—Carbide and Carbon Chemicals Corporation. Oct. 16, 1936. 492,558.

BONDING OF CALCIUM SILICATES.—N. P. Pitt, and E. G. Baker. April 1, 1937. 492,565.

CONVERSION OF BUTANES INTO GASOLINE BOILING-RANGE LIQUIDS. A. L. Mond (Universal Oil Products Co.). Nov. 12, 1937. 492,567.

PRODUCTION OF MOULDED CERAMIC BODIES, ceramic coatings, and the like.—O. Bormann. Jan. 4, 1937. 492,576.

PRODUCTION OF MOULDED CERAMIC BODIES, ceramic coatings, and the like—.O. Bormann. April 5, 1937. (Addition to 492,576.) 492,577.

MANUFACTURE OF CATALYSTS.—W. P. Williams (Procter and Gamble Co.). Jan. 28, 1938. 492,636.

PROCESS FOR THE MANUFACTURE OF THIAZOLES unsubstituted in the 2-position.—F. Hoffman-La Roche & Co., A.-G. March 12, 1937. 492,637.

SEPARATION OF PROPANE and propylene from gas mixtures.—I. G. Farbenindustrie. Feb. 16, 1937. 492,503.

INCREASING THE AFFINITY FOR DYESTUFFS or articles of cellulose, cellulose derivatives, or polymers soluble in organic solvents.—A. Carpmael (I. G. Farbenindustrie.) Jan. 21, 1937. 492,743.

Chemical and Allied Stocks and Shares

THE new Stock Exchange account, which commenced on Monday, has shown a continuance of the better tendency which recently developed in the stock and share markets. The volume of business was not large, but has made some improvement, and sentiment has benefited from the hope that the upward turn of trade conditions in the United States may be accelerated during the next few months.

International Nickel and most other dollar shares with a wide market on both sides of the Atlantic have been active at better prices. Swedish Match attracted more attention at the higher price of 26s., and Lever and Unilever were also in request, although the disposition is to await the interim dividend decision of the latter company, which falls to be made next month. Imperial Chemical fluctuated moderately and are 30s. 9d. at the time of writing, compared with 30s. 7½d. a week ago. British Oxygen remained under the influence of the maintenance of interim dividend at 7 per cent., which created a good impression in view of the larger capital in issue. British Aluminium, Associated Cement and Turner and Newall were other shares which were reported to be more active, but best prices touched during the past few days were not fully held. Murex were fairly steady around 75s. 6d.xd., it being generally realised that the directors are dealing conservatively with profits and that the 20 per cent. dividend must be regarded as an excellent achievement, bearing in mind the statements as to trade conditions appearing in the report.

Imperial Smelting ordinary shares have moved up sharply to 11s. 9d. as a result of the possibility of tariff changes designed to assist the zinc smelting industry in view of the importance of the latter to national defence. The market is awaiting the statements at the forthcoming meeting with a good deal of interest, although in view of the decision in regard to the dividend on the preference shares, it is apparent that the past year's results will disclose a fall in earnings. Fison Packard and Prentice were relatively steady and continued to transfer around 34s., awaiting the dividend announcement, while B. Laporte remained firm at 85s., pending the forthcoming interim dividend declaration. Blythe Colour Works continued to be quoted at 7s. 6d., and Greeff-Chemicals Holdings at 6s. 3d., and Monsanto Chemicals 5½ per cent. preference at 22s. 3d. were also around the same level as a week ago. British Industrial Plastics 2s. shares kept at 2s. 9d., the assumption in the market being that they will probably be maintained on an 8 per cent. dividend basis.

Triplex Glass 10s. shares fluctuated rather sharply but are 31s. at the time of writing. Lancegaye Safety Glass 1s. ordinary shares were more active at 3s. 4½d., following the directors' statement, which, among other things, indicates that the company proposes to commence the production of raw glass. Wall Paper deferred units were little changed pending the preliminary figures for the past year's working, while Pinchin Johnson, International Paint and other paint shares were higher on balance.

Staveley were better among the securities of iron and steel companies, but Tube Investments were less firm at 82s., awaiting the dividend announcement, expected towards the end of the month. Dorman Long made a better price and Consett Iron were also slightly above the price current a week ago.

Boots Pure Drug were little changed at 41s. 3d., but Timothy Whites and Taylors were slightly lower at 24s. 6d., despite the interim dividend. Sangers were well maintained at 22s. 1½d., and British Drug Houses continued to be quoted at 21s. 3d. Beechams Pills deferred shares were active pending news as to the result of the company's offer in respect of the ordinary shares of Eno Proprietaries. Borax Consolidatd were more active, but at 25s. have not kept all the improvement shown earlier in the week.

Leading oil shares were higher than a week ago, but best prices were not held.

Weekly Prices of British Chemical Products

A STEADY trade is reported from most sections of the general chemical market this week, the flow of inquiry being about normal for the period. A slightly better spot business is being put through in acetic acid, formaldehyde and a number of potash materials and a little more interest is also being displayed in other directions, but there is still room for much improvement in deliveries under existing contracts. No official price changes fall to be recorded for general chemicals, rubber chemicals and wood distillation products, and quotations on the whole remain steady with a firm undertone. Trade in the coal tar section is a little better than of late and values in this market have a decidedly firmer undertone. The volume of actual buying orders, however, is, as yet, far from substantial and buyers are inclined to follow a cautious policy.

Price Changes

Falls: Arsenic, white powdered Cornish (Manchester); Potassium Permanganate, B.P. (Manchester).

MANCHESTER.—New business in chemical products on the Manchester market during the past week has continued on moderate lines, with the majority of orders for small quantities for near delivery positions. So far as deliveries into consumption against contracts are concerned there has been little change in the general position. Here and there a slight improvement has been reported in the quantities covered by specifications for the textile finishing and allied trades, but the position in this important section is far from satisfactory. In other directions deliveries have been on a fair scale. Prices are steady to firm in most departments. With regard to the by-products demand for most descriptions this week has been quiet, but few important changes in values have occurred.

GLASGOW.—Business in general chemicals has become rather quiet since our last report, both for home trade and export. Prices, however, continue very firm at about previous figures, though without any actual quotable changes to report.

General Chemicals

ACETONE.—£45 to £47 per ton.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 2s. 6d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey, £18 10s. per ton, d/d U.K. Fine white, 98%, £17 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8¼d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 3½d. per lb. d/d station in 70-lb. cylinders (1-ton lots).

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0½d. SCOTLAND: B.P. crystals, 1s. 0¾d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £18 10s. per ton f.o.b. SCOTLAND: £19 per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 17s. 6d. to £4 17s. 6d. per cwt. according to quantity; in drums, £3 10s. 0d. to £4 2s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£31 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £31 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £31 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 10d. pe. lb.; powder B.P., 6s. 0d.; bichloride B.P. (corros. sub., 5s. 1d.; powder B.P. 4s. 9d.; chloride B.P. (calomel), 5s. 10d.; red oxide cryst. (red precip.), 6s. 11d.; levig. 6s. 5d.; yellow oxide B.P. 6s. 3d.; persulphate white B.P.C., 6s. 0d.; sulphide black (hyd. sulph. cum sulph. 50%), 5s. 11d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER. £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¼d. to 10¼d. per lb. SCOTLAND: B.P. Crystals, 10¼d. MANCHESTER: B.P. 9¼d. to 11¼d.

POTASSIUM PRUSSIATE.—6½d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6¼d. to 6¾d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

Soda, Caustic.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. Scotland: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

Soda Crystals.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

Sodium Acetate.—£19-£20 per ton carriage paid North. Glasgow: £18 10s. per ton net ex store.

Sodium Bicarbonate.—Refined spot, £10 15s. per ton d/d station in bags. Glasgow: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. Manchester: £10 15s.

Sodium Bisulphite Powder.—60/62%, £14 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£27 10s. to £32 per ton. Glasgow: £1 11s. per cwt., minimum 3 cwt. lots.

Sodium Dichromate.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts.

Sodium Chromate.—4¼d. per lb. d/d U.K. 4d. per lb. Glasgow: 4¼d. net, carriage paid.

Sodium Hyposulphite.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. Manchester: Commercial, £11; photographic, £15 10s.

Sodium Metasilicate.—£14 5s. per ton, d/d U.K. in cwt. bags.

Sodium Nitrate.—Refined, £8 per ton for 6-ton lots d/d. Glasgow: £1 12s. 0d. per cwt. in 1-cwt kegs, net, ex store.

Sodium Nitrite.—£18 5s. per ton for ton lots.

Sodium Perborate.—10%, 9½d. per lb. d/d in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

Sodium Prussiate.—½d. per lb. for ton lots. Glasgow: 5d. to 5¾d. ex store. Manchester: 4¼d. to 5¼d.

Sodium Silicate.—£8 2s. 6d. per ton.

Sodium Sulphate (Glauber Salts).—£3 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. Scotland: Ground quality, £3 5s. per ton d/d. Manchester: £3 12s. 6d.

Sodium Sulphide.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. Manchester: Concentrated solid, 60/62%, £11; commercial, £8 10s.

Sodium Sulphite.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

Sulphur Precip.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

Sulphuric Acid.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

Tartaric Acid.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. Manchester: 1s. 1¼d. per lb. Glasgow: 1s. 1¼d. per lb., 5%, ex store.

Zinc Sulphate.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

Antimony Sulphide.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

Arsenic Sulphide.—Yellow, 1s. 5d. to 1s. 7d. per lb.

Barytes.—£6 to £6 10s. per ton, according to quality.

Cadmium Sulphide.—3s. 9d. to 4s. per lb.

Carbon Black.—3¼d. to 3 15/16d. per lb., ex store.

Carbon Disulphide.—£31 to £33 per ton, according to quantity, drums extra.

Carbon Tetrachloride.—£41 to £46 per ton, according to quantity, drums extra.

Chromium Oxide.—Green, 10½d. to 11d. per lb.

Diphenylguanidine.—2s. 2d. per lb.

India-rubber Substitutes.—White, 4¾d. to 5¼d. per lb.; dark 3¾d. to 4¼d. per lb.

Lamp Black.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

Lead Hyposulphite.—9d. per lb.

Lithopone.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

Sulphur.—£9 to £9 5s. per ton. Sulphur precip. B.P., £55 to £60 per ton. Sulphur precip. comm., £50 to £55 per ton.

Sulphur Chloride.—5d. to 7d. per lb., according to quantity.

Vermilion.—Pale, or deep, 4s. 9d. per lb., 1-cwt. lots.

Zinc Sulphide.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

Ammonium Sulphate.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

Calcium Cyanamide.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.

Nitro Chalk.—£7 10s. 6d. per ton up to June 30, 1939.

Sodium Nitrate.—£8 per ton for delivery up to June 30, 1939.

Concentrated Complete Fertilisers.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

Ammonium Phosphate Fertilisers.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

Benzol.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d., 90%, 1s. 4½d. to 1s. 5d., pure, 1s. 8½d. to 1s. 9d. Glasgow: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. Manchester: Pure, 1s. 8d. per gal.; crude, 1s. per gal.

Carbolic Acid.—Crystals, 7½d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 1s. 9d. to 2s. 0d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

Creosote.—Home trade, 4½d. per gal., f.o.r. makers' works; exports 6⅜d. to 6⅝d. per gal., according to grade. Manchester: 4d. to 5d. Glasgow: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5¼d.; lower sp. gr. oils 5¾d. to 6¼d.

Cresylic Acid.—97/99%, 1s. 9d. to 2s.; 99/100%, 2s. 6d. to 3s. 6d. per gal., according to specification; Pale, 99/100%, 2s. 1d. to 2s. 3d.; Dark, 95%, 1s. 7d. to 1s. 8d. per gal. Glasgow: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. Manchester: Pale, 99/100%, 2s.

Naphtha.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. Glasgow: Crude, 6½d. to 7¼d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

Naphthalene.—Crude, whizzed or hot pressed, £5 to £6 per ton; purified crystals, £11 per ton in 2-cwt. bags. London: Fire lighter quality, £3 to £4 10s. per ton. Glasgow: Fire lighter, crude, £6 to £7 per ton (bags free). Manchester: Refined, £12 10s. to £13 10s. per ton f.o.b.

Pitch.—Medium, soft, 33s. per ton, f.o.b. Manchester: 31s. 6d. f.o.b., East Coast. Glasgow: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

Pyridine.—90/140%, 11s. 6d. to 13s. 6d. per gal.; 90/160%, 9s. 6d. to 10s. 9d. per gal.; 90/180%, 2s. 6d. to 3s. 6d. per gal. f.o.b. Glasgow: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. Manchester: 9s. 6d. to 11s. 6d. per gallon.

Toluol.—90%, 1s. 10d. per gal.; pure 2s. 2d. Glasgow: 90% 120, 1s. 10d. to 2s. 1d. per gal. Manchester: Pure 2s. 4d. per gallon, naked.

Xylol.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s. 3½d. Glasgow: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

Calcium Acetate.—Brown, £6 15s. to £9 5s. per ton; grey, £8 15s. to £9 5s. Manchester: Brown, £8 10s.; grey, £9 15s.

Methyl Acetone.—40.50%, £36 to £38 per ton.

Wood Creosote.—Unrefined, 4d. to 6d. per gal., according to boiling range.

Wood Naphtha, Miscible.—2s. 8d. to 3s. per gal.; solvent, 3s. 3d. to 3s. 6d. per gal.

Wood Tar.—£2 to £8 per ton, according to quality.

Intermediates and Dyes

Aniline Oil.—Spot, 8d. per lb., drums extra, d/d buyer's works.

Aniline Salts.—Spot, 8d. per lb. d/d buyer's works, casks free.

Benzidine, HCl.—2s. 7½d. per lb., 100% as base, in casks.

Benzoic Acid, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

***m*-Cresol 98/100%.**—1s. 8d. to 1s. 9d. per lb. in ton lots.

***o*-Cresol 30/31° C.**—6½d. to 7½d. per lb. in 1-ton lots.

***p*-Cresol, 34-5° C.**—1s. 7d. to 1s. 8d. per lb. in ton lots.

Dichloraniline.—2s. 1½d. to 2s. 5½d. per lb.

Dimethylaniline.—Spot, 1s. 7½d. per lb., package extra.

Dinitrobenzene.—8d. per lb.

Dinitrochlorbenzene, Solid.—£79 5s. per ton.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 11d.

Diphenylamine.—Spot, 2s. 2d. per lb., d/d buyer's works.

Gamma Acid, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H Acid.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

Naphthionic Acid.—1s. 10d. per lb.

***β*-Naphthol**—£97 per ton; flake, £94 8s. per ton.

***α*-Naphthylamine.**—Lumps, 1s. 1d. per lb.

***β*-Naphthylamine.**—Spot, 3s. per lb.; d/d buyer's works.

Neville and Winther's Acid.—Spot, 3s. 3½d. per lb. 100%.

***o*-Nitraniline.**—4s. 3½d per lb.

***m*-Nitraniline.**—Spot, 2s. 10d. per lb. d/d buyer's works.

***p*-Nitraniline.**—Spot, 1s. 10d. to 2s. 3½d. per lb. d/d buyer's works.

Nitrobenzene.—Spot, 4½d. to 4¾d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

Nitronaphthalene.—10½d. per lb.; P.G., 1s. 0½d. per lb.

Sodium Naphthionate.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

Sulphanilic Acid.—Spot, 8¾d. per lb. 100%, d/d buyer's works.

***o*-Toluidine.**—11d. per lb., in 8/10 cwt. drums, drums extra.

***p*-Toluidine.**—1s. 11d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 8d. per lb., 100%.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

FARRAR FERTILISERS, LTD., Kenardington. (M.C., 15/10/38.) Sept. 28, £245 debenture, to T. B. Durose, Whetstone; general charge.

POLARISING MATERIALS, LTD., London, S.W. (M.C., 15/10/38.) Oct. 3, £1,200 debenture, to Polaroid Corporation, Delaware, U.S.A.; general charge.

County Court Judgments

DERHAM, Arthur J. O., Brooklyn, Almond Brook Road, Standish, liquid soap manufacturer. (C.C., 15/10/38.) £10 6s. 11d. Sept. 8.

E. C. BURGOYNE AND CO., LTD., R/O., Brytor Works, 32 Gould Street, May Road, Twickenham, cellulose lacquer manufacturers. (C.C., 15/10/38.) £24 8s. 0d. Sept. 10.

ZERMOPAD, LTD., 4 Queen Victoria Street, E.C.4, chemical manufacturers. (C.C., 15/10/38.) £20 0s. 7d. Sept. 5.

Forthcoming Events

London.

October 19.—Society for the Study of Alchemy and Early Chemistry. University College, Gower Street, W.C.1. 8 p.m. Dr. R. J. Forbes, "Bitumen and Petroleum in Antiquity."

October 21.—The Institute of Chemistry. 30 Russell Square, W.C.1. 8 p.m. Professor F. M. Rowe, "The Development of the Chemistry of Dyestuffs."

October 26.—Iron and Steel Institute. Annual Meeting. Institution of Civil Engineers, Great George Street, S.W.1. 10 a.m. and 2.30 p.m.

Iron and Steel Institute (London Section) Royal School of Mines, South Kensington. 8 p.m. Professor G. I. Finch, "Electron Diffraction and Surface Wear."

Belfast.

October 21.—Institute of Chemistry. Royal Belfast Academical Institution. 7.30 p.m. Dr. R. H. Common, "The Chemistry of the Egg."

Bristol.

October 20.—Institute of Chemistry. The University, Woodland Road. 5.30 p.m. A. W. Knapp, "Vitamin D and Cacao Shell."

Cardiff.

October 26.—Cardiff Technical College Chemical Society and Local Fellows of the Chemical Society. Technical College. 6 p.m. Professor J. Kenyon, "Optical Activity as a Guide to Reaction Mechanism."

Hull.

October 18.—Hull Chemical and Engineering Society. Municipal Technical College, Park Street. 7.45 p.m. K. MacLennan, "The Utilisation of Cod Liver Oil."

Leeds.

October 24.—Society of Chemical Industry. A. H. Dodd, "Chemical Preparations for the Motorist."

Liverpool.

October 21.—Society of Chemical Industry. The University. 6 p.m. B. D. W. Luff, "Chemists and Cargoes."

October 22.—Associated Learned Societies. Exhibition and Soiree. City Technical College, Byrom Street. 4 p.m.

Manchester.

October 19.—Manchester Metallurgical Society. Blackfriars House, Blackfriars Street. 7.15 p.m. U. R. Evans, "Some Researches into the Mechanism of Corrosion."

October 20.—Institute of Chemistry. Constitutional Club. 7 p.m. Discussion on the Proposed Supplemental Charter.

October 21.—Oil and Colour Chemists' Association. Constitutional Club, St. Ann's Street. 7 p.m. Special General Meeting. Society of Dyers and Colourists. Literary and Philosophical Society, 36 George Street. 7 p.m. Dr. Hasse, "Modern Printing."

Company News

Mouldrite, Ltd. (formerly Croydon Mouldrite, Ltd.) has changed its name to I.C.I. (Plastics), Ltd.

Timothy Whites and Taylor's Ltd., have declared an interim dividend of 7½ per cent., less tax, on the ordinary shares.

Babcock and Wilcox have decided to maintain the interim dividend on the ordinary shares at 4 per cent. in respect of the current year.

Hercules Chemical Manufacturing Company, Ltd., has increased its nominal capital by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £1,000.

Erinoid, Ltd., for the year to July 31, show a net profit of £14,605 (£23,075); to reserve for tax, £4,209 (£5,666); interim 2 per cent., final nil (against total of 8 per cent.); forward £8,820 (£4,846).

Beechams Pills.—Negotiations for the acquisition of Eno Proprietaries by Beechams Pills have now been completed. This week the shareholders of Eno Proprietaries received an offer for the exchange of eight 5s. ordinary shares of Eno Proprietaries for five 2s. 6d. deferred shares of Beechams Pills. It is intended shortly to convene an extraordinary meeting of Beechams Pills for the purpose of increasing the authorised share capital to £3,812,500 by the creation of £2,500,000 further deferred shares of 2s. 6d.

Murex, Ltd., report net profits for the year to June 30 of £257,697 (£280,248). Trading profits, after depreciation, increased from £303,501 to £346,657, and total income amounts to £429,855 (£381,551). After allowing for tax, N.D.C., obsolescence reserve, allocation to general reserve is doubled at £100,000 and £90,463 is carried forward (£81,266) brought in, after allowing for a loss of £28,847 on the sale of local loans. As previously announced the year's dividend and bonus is maintained at 20 per cent., less tax.

New Companies Registered

Zamo Manufacturing Company, Ltd. 344,898.—Private company. Capital £100 in 100 shares of £1 each. To carry on the business of manufacturers of the Zamo and other disinfectants; manufacturing chemists; manufacturers of germ destroyers and chemicals, etc. Directors: Albert E. Rhodes, 2 Clarence Mansions, Rowhill Road, E.5; Horace F. Rhodes; Ernest W. Rhodes; Caroline M. Rhodes. Registered office: 1a Lyon Street, N.1.

Daryhone, Ltd. 344,702.—Private company. Capital £100 in 100 shares of £1 each. To carry on the business of manufacturers and distributors of waterproofing compounds, paints, varnishes, enamels, preservatives, polishes, lacquers, shellac, cellulose, size, pigments, oils, colours, wax, fertilisers, disinfectants, chemicals, gases, drugs, fire-resisting, fumigating and freezing compounds, etc. Directors: Mrs. Lilian Davies, 8 Pittshead Mews, Park Lane, W.1; David Honesberg; Walter S. Ryan. Registered office: Guildhall Annexe, 23 King Street, E.C.2.

Books Received

Vitamine und Hormone. By Dr. Erick Vincke. Leipzig: Verlag Von S. Hirzel. Pp. 162. RM 7.50.

An Introduction to Industrial Rheology. By G. W. Scott Blair. London: J. & A. Churchill, Ltd. Pp. 143. 7s. 6d.

The Phase Rule and Phase Reactions. By Sydney T. Bowden. London: Macmillan and Co., Ltd. Pp. 303. 10s.

Industrial Chemistry. By. W. T. Read. 2nd edition. New York: John Wiley & Sons, Inc. London: Chapman and Hall, Ltd. Pp. 605. 25s.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

British India.—A well-established firm of agents at Karachi wishes to obtain the representation, on a commission or consignment basis, of United Kingdom manufacturers of paints and varnishes for Karachi, Sind, Baluchistan, Punjab and Delhi. (Ref. No. 245.)

British India.—The Director-General, India Stores Department, Belvedere Road, Lambeth, London, S.E.1, invites tenders for 50 tons ferro-manganese. Tenders due October 28, 1938. Forms of tender obtainable from the above at a fee (which will not be returned) of 5s. (Ref. No. 250.)